The Journal
of
Speech Disorders

VOLUME 10 DECEMBER, 1945 NUMBER 4

Medical Follow-up of Hearing Tests

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ALTHOUGH reports of the incidence of hearing loss among children as shown by testing programs are numerous, the literature contains very few surveys of the actual end-results of a hearing conservation program. The rapid development of such programs naturally implies that the hearing of children can be conserved through case finding and medical follow-up techniques. The Michigan Department of Health has received many requests for figures showing what may be expected in improved or conserved hearing from a hearing conservation program. It was to obtain such information that the following survey was made, and it is presented to the profession for whatever interest it may afford.

Many factors contribute to the difficulty of securing adequate information which may be used to evaluate a hearing conservation program. Complete information concerning past or present medical treatment is almost impossible to secure in a field program. The variability of hearing in many types of ear conditions suggests that many audiograms should be taken to obtain an average—this is impossible in most large programs. Variations in testing rooms and testing conditions, and in both the tester and the subject, contribute to variations in audiograms.

Even if factors cannot be controlled to the extent that exact objective data can be secured, a survey in which these factors are controlled as much as possible should show trends that would be of value in estimating the effectiveness of this phase of the school health program.

THE SUBJECTS

THE RESULTS of hearing conservation programs in five Michigan areas were taken as the basis for this paper. From these five areas all children were selected upon whom definite history and information were available in the form of: (1) reports from examining physicians, and (2) statements made by parents at a parent interview when such statements were supported by information in health department family folder files. From this group, all the children were selected who had never consulted a physician or received medical treatment for an ear condition previous to the hearing conservation program.

Complete information was available for 248 children with a total of 327 ears with hearing losses. Of these, 142 ears with hearing losses had received medical treatment following the case finding program, while 144 ears had not. Reliable information on ears with

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hearing losses considered permanent or reported as 'poor prognosis' by the examining physician was much easier to obtain, and 41 ears with reported 'poor prognosis' are included in this survey. Actually, in the Michigan program the average incidence of ears reported by physicians as having a poor prognosis has been about 10 per cent.

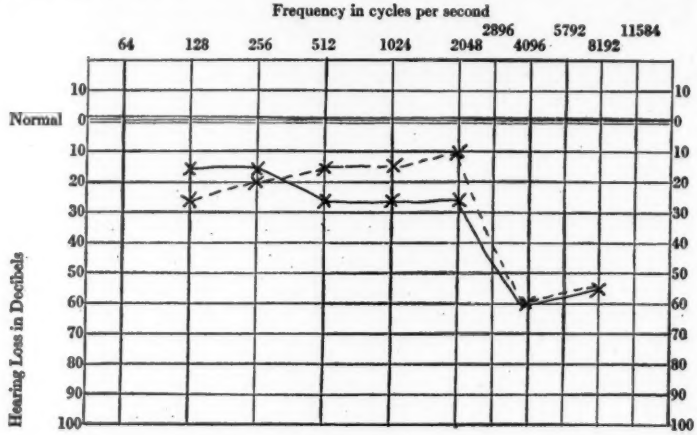

FIGURE 1. Case 41: Two successive audiograms of one of the cases included in the survey. Unilateral hearing loss, right ear.
First Test: x - - - - x Class 4
Second Test: x———x Class 5

PROCEDURE

THE case finding and referral service of the Michigan Hearing Conservation Program uses commonly accepted testing procedures, screening of all children by the group audiometer with pure-tone testing of suspicious cases. The basis of referral for medical follow-up varies with the area, usually being decided after conferences with local otologists. This explains the absence in this survey of the commonly found 'island' hearing losses at frequency 4096. In most areas children showing hearing losses above 20 decibels are not referred for medical follow-up.

After the preliminary testing program, public health nurses conduct follow-up home calls relative to securing medical examination for the children referred with hearing losses. Approximately a year later a return visit is made to each area, at which time parents are interviewed and a second audiogram is taken of the children who participated in the program. The two audiograms of each child are used in reporting the present survey.

The differences between first and second audiograms have been expressed in terms of gain or loss in average decibels for speech frequencies (256, 512, 1024, and 2048) and for high frequencies (4096 and 8192). This method of estimating gains in hearing following medical treatment is commonly used. That it is not ideal is readily apparent to anyone familiar with audiometry, but it represents a way of estimating differences in hearing other than by subjective opinion.

Plus or minus ten decibels was used in this survey as a measure of change; less than that tends to obscure results through variations in audiograms due to testing conditions. Gardner (**3**, 11)

used 7 per cent as the measure of change. Fowler (**2**, 204) states that an improvement of less than 15 decibels for the speech range should not be considered significant.

Figure 1 illustrates a step in the development of a hearing loss that is fairly common. Figure 2 illustrates another change that is perhaps significant. Both audiograms present less than an average 10 decibel change in the speech frequencies.

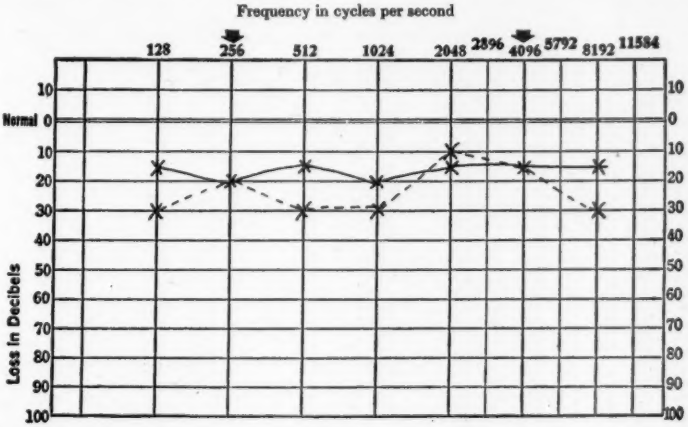

FIGURE 2. Case 213: Another representative audiogram selected from the survey. Unilateral hearing loss, right ear.
First Test: x - - - - x Class 2
Second Test: x———x Class 1

IN AN EFFORT to bring a clearer picture of certain changes between first and second audiograms, Ciocco and Palmer's (**1**, 3-5) method of classification of audiograms was used. In this classification audiograms are divided into eight basic categories, described as follows:

Group 1. Good hearing for all tones. All tones are heard at an intensity equal to or less than 20 decibels.

Group 2. Slight loss for frequencies of the middle range, 256 to 1024. These tones are heard at an intensity between 25 and 35 decibels.

Group 3. Slight loss for high tones. Tones of 2048, 4096, and 8192 are heard at an intensity between 20 and 35 decibels.

Group 4. Marked high-tone loss of the abrupt type. Tones of 2048, 4096, and 8192 are heard only at an intensity greater than 30 decibels.

Group 5. Marked high-tone loss with involvement of low and middle tones. The curves slope downward from left to right. The impairment for high tones is greater than that for low tones.

Group 6. Moderate loss for all tones. Thresholds between 20 and 45 decibels.

Group 7. Marked loss for all tones. Thresholds between 45 and 65 decibels.

Group 8. Extreme loss for all tones. No tone heard at an intensity less than 55 decibels.

To Ciocco and Palmer's eight classifications we have added another:

Group 9. Marked involvement of low tones with slight or no involvement of high tones.

A summary of the changes in class of hearing loss between first and second audiograms is presented in Table 4.

TABLE 1. Group of ears without previous medical attention which received medical treatment following preliminary program, with data indicating change in audiometric response for speech frequencies (256, 512, 1024, 2048) and high frequencies (4096 and 8192) following medical treatment.

Case No.	Gain		Loss		Classification[1]		Remarks
	Speech	High	Speech	High	First Test	Retest	
4	12	25	....		5	1	
7	17	....			9	1	
7	....	....			2	2	
10	19	45			6	1	
12	*	*			6		Not retested; recent mastoidectomy
14	....	25			3	1	
21	11	10			5	5	
21	23	32			5	5	
23	29	55			5	1	
24	16	10			4	4	
24	....	37			4	4	
25	15	20			2	1	
26	22	19			2-4	1	
27	11	14			3	1	
27	20	23			5	1	
28	17	32			2-4	1	
31	19	30			7	2	
37	11	24			3	1	
37	....	30			3	1	
52	....	....	....	....	9	9	
54	17	49			6	1	
54	24	42			5	4	
56	....	....	....	....	2	1	Improvement to less than 20db.
56	15	10			6	1	
57	33	22			7	5	
58	20	....			5	4	
59	22	20			6	1	
60	17	17			2-4	4	
61	37	55			7	1	
68	10	....			6	6	
69	....	....	....	....	6	3	
69	....	12			6	3	
70	13	10			7	6	
70	....	12			6	9	
71	21	....			6	3	
71	19	27			6	3	
72	20	40			5	1	
73	....	....	....	....	9	2	
73	....	....	....	....	9	2	
75	....	15			5	5	
75	....	....	....	....	5	5	
76	22	23			6	3	
88	21	20			6	1	
91	....	....			8	8	
97	14	15			2-4	1	
100	25	35			6	1	
100	17	32			6	1	
109	12	13			3	1	
109	....	15			3	1	
111	19	32			7	1	
111	12	15			1	1	
112	21	25			6	1	
117	12	....			6	1	

TABLE 1. *(Continued)*

Case No.	Gain		Loss		Classification[1]		Remarks
	Speech	High	Speech	High	First Test	Retest	
117	12	....			6	1	
119	....	....	....	....	2	1	Gain to less than 20 db.
120	13	13			6	1	
122	15	20			2	1	
122	12	18			2	1	
124	10	23			5	3	
124	27	45			8	5	
127	22	20			6	1	
129	10	25			2	1	
129	26	30			7	1	
132	10	10			6	5	
136	23	40			5	1	
139	16	10			2	1	
139	11	....			2	1	
140	10	32			4	1	
141	12	27			4	1	
143	....	25			4	1	
145	17	12			9	1	
155	18	30			5	1	
157	12	20			6	1	
159	*	*			7		Not retested; recent mastoidectomy
161	25	35			7	1	
162	12	22			2-4	1	
162	15	18			2-4	1	
164	....	20			3	1	
165	14	10			2	1	
165	14	....			2	1	
166	....	....	....	....	7	7	Still under treatment, 2nd test
167	11	15			5	2	
168	11	20			6	1	
169	21	32			6	1	
171	17	12			5	5	
171	25	15			7	5	
173	....	....	....	....	6	6	
175	12	12			2-4	1	
176	20	....			2-4	4	
176	....	....	....	....	2	2	
177	13	10			6	1	
177	....	....			2	1	Gain to less than 20 db.
179	21	15			6	1	
179	16	....			6	1	
180	12	27			2-4	1	
180	14	30			2-4	1	
181	....	25			3	1	
182	16	35			5	1	
183	12	35			3	1	
183	11	35			3	1	
187	*	25			3	1	
188	*	32			4	1	
188	*	17			4	3	
189	....	17			6	2	
189	15	22			6	1	
191	12	15			6	1	
191	16	15			6	1	
192	17	25			2-4	1	
192	12	20			2-3	1	
195	....	....	....	....	2-4	4	

TABLE 1. *(Continued)*

Case No.	Gain		Loss		Classification[1]		Remarks
	Speech	High	Speech	High	First Test	Retest	
195	10	....	....	....	2-4	4	
201	....	....	....	....	8	8	
203	....	....	....	....	4	4	Treatment preventive of
204	....	....	....	....	6	6	further damage
205	14	....			2	1	
206	....	....	....	....	2	2	
209	15	32			6	1	
212	11	27			6	1	
213	....	....	....	....	2	1	Gain to less than 20 db.
214	17	40			6	1	
216	12	27			2-4	1	
217	....	....	....	....	2	3	
218	18	45			6	1	
218	30	40			6	1	
220	20	35			2-3	1	
220	16	30			2-3	1	
221	*	20			3	1	
224	....	10			5	5	
225	....	....	....	....	7	7	
227	12	20			6	6	
234	13	25			3	1	
238	17	25			2-3	1	
239	....	....	....	....	5	5	
239	....	....	....	....	5	5	
240	....	....	....	....	8	8	Treatment preventive of
241	16	35			6	1	further damage
242	41	47			7	1	
242	....	23			2-3	1	
244	10	22			3	1	
246	15	....			6	1	
247	11	....			2	1	
248	10	....			2	1	

[1]See accompanying text for explanation.
*Not determined.

DIFFERENCES in hearing between first and second tests are summarized in Table 5.

Of the group of ears receiving medical treatment, 120, or 85 per cent, showed an improvement in hearing. If Ciocco and Palmer's classification of good hearing for all tones is accepted, then 65 per cent of the treatment group might be considered to have been improved to 'normal' or good hearing. Figure 3 illustrates one of the cases that showed improvement following medical treatment.

Twenty ears, or 14.1 per cent of the treatment group, showed no change in hearing or an average change of less than 10 decibels. One of these, Case 166, was under medical treatment at the time the second audiogram was made, while two cases, No. 203 and 240, were given treatment preventive of further damage, although they were not definitely reported as having poor prognosis. Of the remaining 17 cases, 12 ears showed no change in class of hearing loss. Five ears, cases 69, 73, 195 and 217, show classification changes which might be interpreted as improvement in hearing.

Thirty-four ears in the control group, 23.6 per cent, showed improvement in hearing; 11.8 per cent of this group improved to 'normal' or good hearing. Case 46 presented a discharging ear at the first test which was dry when the second test was taken.

In the control group, 76.3 per cent of the ears showed no change in hearing or a greater loss of hearing at the

TABLE 2. Group of ears which have never received medical attention, with data indicating change in audiometric response from first test to second test about a yeat later, for speech frequencies and high frequencies.

Case No.	Gain		Loss		Classification[1]		Remarks
	Speech	High	Speech	High	First Test	Retest	
1	....	....	....	....	7	7	
2	....	....	....	....	2	2	
2	14	....			6	3	
3	....	....	....	....	5	5	
5	....	....	....	....	6	6	
6	....	....	....	....	8	8	Congenital atresia
19	....	10			2-4	6	
19			16	....	4	6	
20	26	30			7	1	
22	....	....	....	....	7	7	
22			12	....	5	7	
29	....	....	....	....	9	9	
29	....	....	....	....	9	9	
30	....	35			5	1	
32	....	....	....	....	4	4	
33	....	....	....	....	4	4	
35	....	....	....	....	6	6	
36	....	....	....	....	5	5	
38	....	....	....	....	7	7	
38	....	....	....	....	8	8	
41	....	....	....	....	4	5	
42	....	....	....	....	5	5	
42	....	....	....	....	5	5	
43	....	....	....	....	5	5	
45	....	10	....		5	6	
46	19	....			6	5	Discharging ear first test;
47	....	....	....	....	3	5	dry at second test
49	....	....	....	....	9	9	
50			10	....	1	1	
50	....	....	....	....	6	6	
51	....	....	....	....	8	8	
55	16	30			6	1	
62			12	11	4	2-4	
62			....	11	4	2-4	
63	....	....	....	....	5	6	
64			....	14	7	5	
64	....	....	....	....	5	7	
65	....	....	....	....	2	6	
66			14	15	6	7	
67	14	22			4	1	
74	25	10			6	3	
74	26	22			6	1	
77	....	....	....	....	6	6	
77	....	....	....	....	6	6	
78	....	....	....	....	5	5	
81	....	....	....	....	6	6	
82	....	....	....	....	9	9	
83	....	....	....	....	9	9	
83			10	25	9	9	
87	....	....	....	....	6	6	
89	....	....	....	....	7	7	
90	....	....	....	....	7	7	
92	....	....	....	....	2	2	
93	....	....	....	....	3	3	
93	....	....	....	....	3	3	
94	....	....	....	....	8	8	

TABLE 2. *(Continued)*

Case No.	Gain		Loss		Classification[1]		Remarks
	Speech	High	Speech	High	First Test	Retest	
95	....	....	....	....	6	6	
96			16	35	1	5	
96			....	15	6	5	
98	....	....	....	....	8	8	
99	13	18			6	1	
101	....	....	....	....	2	1	Improvement to less than 20 db.
103	....	....	....	....	6	6	
104	32	35			7	1	
105	12	....			6	3	
106	....	....	....	13	6	6	
106	11	12			6	1	
107	35	35			6	1	
108	20	10			6	1	
110	....	....	....	....	3	3	
113	....	....	....	....	6	6	
115	....	....	....	....	8	8	
115	....	....	....	....	4	4	
116	15	32			3	1	
118	....	....	....	....	8	8	
121	....	....	....	....	9	9	
121	....	15			9	9	
123	....	....	....	....	8	8	
126	19	32			5	1	
128			12	....	6	7	
130	....	10			8	8	
131	17	35			5	1	
131	20	25			6	3	
133	....	....	....	....	6	6	
135			15	15	3	5	
135	....	14			3	3	
137	....	....	....	....	6	6	
138	13	....			6	6	
138	....	19			2-4	1	
142	....	....	....	....	6	6	
142	....	....	....	....	6	6	
144	....	....	....	....	2-4	6	
146			17		4	6	
146			17		1	6	
148	....	....	....	....	5	5	
149	....	....	....	....	4	4	
149	....	15			4	4	
150			....	15	4	4	
151	....	....	....	....	6	7	
151	....	15			7	7	
152	....	....	....	....	5	5	
152			....	30	1	5	
153			....	10	2	2	
154	19	13			6	4	
158	....	....	....	....	2	2	
158	....	....	....	....	2	2	
160			....	12	2	6	
160			....	40	1	5	
163	16	30			6	1	
170	....	....	....	....	5	5	
172			....	10	5	5	
174	....	....	....	....	6	6	
184	....	....	....	....	8	8	
185			....	15	6	6	
186			11	....	7	8	

TABLE 2. *(Continued)*

Case No.	Gain		Loss		Classification[1]		Remarks
	Speech	*High*	*Speech*	*High*	*First Test*	*Retest*	
186	16	32			6	1	
193	....	....	....	....	4	4	
193	....	....	....	....	4	4	
194			15	10	5	5	
194			14	....	5	5	
197	....	....	....	....	4	4	
198	....	....	....	....	6	7	
199	19	22			6	1	
202	....	....	....	....	4	4	
207	11	17			6	9	
208	....	....	....	....	6	6	
210			10	....	2-4	6	
211	....	....	....	....	8	8	
215	....	....	....	....	7	7	
222			....	12	6	6	
223	14	....	....	....	6	3	
223	14	35			6	3	
228	....	....	....	....	2	2	
229	....	....	....	15	5	5	
229	....	....	....	....	5	5	
230	....	....	....	....	6	6	
232			26	....	4	6	
235	....	....	....	....	8	8	
236	....	....	....	....	6	6	
236			15	....	6	7	
237	....	....	....	....	2-3	2-3	
237			....	35	6	5	
243	....	....	10	....	6	6	
245	....	....	....	....	4	4	

[1]See accompanying text for explanation.

second test. When considered from the standpoint of class of hearing loss, 69 of the 78 ears which showed average changes in hearing of less than 10 decibels, remained in the same classification. Eight ears, cases 41, 47, 63, 64, 65, 144, 151 and 198, might be considered to have an additional loss of hearing according to the classification change.

Many of the reports of improvement following medical treatment in ear disorders have considered only improvement as measured by average decibel gains in speech frequencies. It has been noted throughout the Michigan program that many children presenting only high frequency losses have received medical treatment with apparent subsequent improvement of hearing for high frequencies. Cases 143, 187, 188 and 221 are examples.

DISCUSSION

ONE OF THE problems which the average hearing conservation program needs to combat is the tendency to place too much importance on hearing testing and not enough importance on hearing conservation. The average school or health department is usually eager to have the hearing of pupils tested, yet is often reluctant to spend time or money for a proper follow-up of testing results in order to secure medical attention for the children with hearing losses. There is ample evidence in medical literature of the efficacy of early medical treatment in the prevention of hearing losses, yet many school and health people, and even physicians and ear specialists, remain skeptical of direct results in conserving hearing following case-finding programs.

TABLE 3. Group of children with hearing losses reported permanent by examining physician with data indicating change in audiometric response from first test to second test about a year later, for speech frequencies and high frequencies.

Case No.	Gain		Loss		Classification[1]		Remarks
	Speech	High	Speech	High	First Test	Retest	
6	*	*	*	*	8	8	Congenital atresia
8	....	....	....	....	6	6	
8	....	....	....	....	6	6	
9					8	8	
11					8	8	
13					8	8	Congenital atresia
14					8	8	
15					8	8	
16	....	15			6	2	
17	....	....	....	....	Island	Island	Island loss 60 db. 4096
18	....	....	....	....	Island	Island	Island at 4096
26					8	8	
34					8	8	
39	....	17	....	....	6	6	
39	....	....	....	....	7	7	
40	....	....	....	....	9	9	
44	....	....	....	....	5	5	
44	12	10	....	....	5	5	
48			....	10	4	4	
53					8	8	
79					8	8	
80					8	8	
84					8	8	
85					8	8	
86	....	....	....	....	6	6	
102					8	8	Congenital atresia
114					8	8	
125					8	8	
134					8	8	
147					8	8	
156					6	6	
178					8	8	
190					5	5	
196					8	8	
196					7	7	
200					8	8	
214					8	8	
219					8	8	
226					6	6	
231					8	8	
233					5	5	

[1]See accompanying text for explanation.
*Not determined.

The figures presented here may not be typical. So far the Michigan program has functioned only in areas in which there are otologists or other 'interested' physicians. This undoubtedly has a relation to the results presented in this paper. The figures do suggest that a carefully administered hearing testing program with emphasis upon follow-up procedures can show definite results in the conservation of hearing.

The number of children not consulting physicians, even following hearing testing programs, indicates that the general public is relatively ignorant of the implications of ear disorders. Although specific figures are not available at this time, most children with hearing losses in our Michigan pro-

TABLE 4. Changes in class of hearing loss between first and second tests (see accompanying text for descriptions of the various classes.)

Class of Hearing Loss	*Total in first test*	*Medical Treatment Group*		*No Treatment Group*		*Poor Prognosis Group*	
		First	*Retest*	*First*	*Retest*	*First*	*Retest*
Class 1	6	1	91	5	19	0	0
Class 2	28	19	8	9	6	0	1
Class 3	21	14	8	7	10	0	0
Class 4	27	8	9	18	12	1	1
Class 5	44	19	12	21	24	4	4
Class 6	96	41	5	48	34	7	6
Class 7	25	12	2	11	14	2	2
Class 8	40	4	3	12	13	24	24
Class 9	14	5	2	8	9	1	1
Class 2-4	18	14	0	4	2	0	0
Class 2-3	6	5	0	1	1	0	0
Not Determined Island Loss	2		2			2	2
TOTALS	327	142	142	144	144	41	41

gram have histories of discharging ears, earaches, and other manifestations which are largely ignored by parents and teachers, and even in many cases, by school nurses. Economic considerations may have some relation to the lack of medical attention in some cases, although in Michigan, as in many other states, indigent children may secure treatment through state funds.

EDUCATION of the public to the fact that hearing impairment may often be prevented, and education of the community to the importance of securing early medical attention in ear disorders, should be the primary objective of a hearing conservation program. Emphasis must be placed on the fact that good hearing and good general health are closely related. A decrease in the common communicable

TABLE 5. Summary—Hearing scores, first and second tests.

	Treatment Group		*No Treatment Group*		*Poor Prognosis Group*
	N	*%*	*N*	*%*	*Number*
Total ears showing improvement to Class 1 (below aver. 20 db)	91	65	17	11.8	0
Ears showing gains in hearing, speech or high frequencies, over 9 decibels	29	20.7	17	11.8	3
Total showing improvement in hearing	120	85.7	34	23.6	
Ears showing no change in hearing loss or change less than 10 decibels	20	14.1	78	54.1	37
Ears showing additional loss greater than average 9 db	0	0	32	22.2	1
Total ears showing no change in hearing or greater loss	20	14.1	110	76.3	
Ears not retested	2				

diseases will result in a decrease of middle ear infections. Immunization and protective treatments will prevent or modify some communicable diseases that result in ear infections and hearing losses. If all parents secured medical attention for their children following or during earaches, discharging ears, and other similar signs of ear trouble, few children with preventable hearing losses would appear in a testing program. This should be the goal of a hearing conservation program.

SUMMARY

1. Two audiograms were taken a year apart for 248 children, with 327 ears with hearing losses, who had received no medical attention previous to

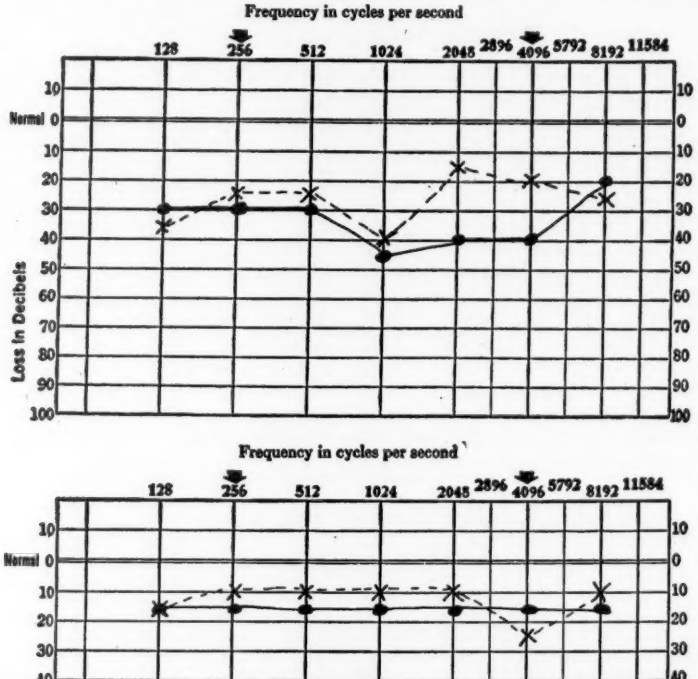

FIGURE 3. Case No. 179: Bilateral hearing loss. First audiogram September 16, 1943. Otologist's recommendations: 'Advise tonsillectomy and adenoidectomy, urgent.' Second audiogram October 25, 1944, following operation.
Right ear: •———•
Left ear: x - - - - x

a hearing conservation program. The audiograms were divided into two groups, those of children who received medical attention following the first test program and those of children who received no medical attention. First and second audiograms were analyzed to compare gains and losses of hearing for the two groups.

2. Of the group of ears receiving medical treatment after the case finding program, 85 per cent showed improvement in hearing, 65 per cent of them to the range of 'normal' hearing (below an average loss of 20 decibels). Of the group of ears receiving no medical treatment, 23 per cent showed some improvement in hearing; 11 per cent of them to the range of 'normal' hearing.

3. Only 14 per cent of the group receiving medical treatment showed no change in hearing loss, and none of them had a greater loss at the second testing. Of the group that received no medical treatment, 76 per cent retained the same hearing loss and 22 per cent showed a greater loss of hearing at the second testing.

4. These figures indicate that hearing of school children can be conserved through careful testing programs with emphasis upon medical follow-up.

5. The author believes that public education in hearing conservation is badly needed, and should be the primary objective in a hearing conservation program.

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GENES FOR WHAT?

Man is everywhere the speaker, and the faculty of speech has been credited to the genes by many. Even Boas, who in general is very averse to relying on the genes, says, "The faculty of speech is organically determined and should be called, therefore, instinctive." This is in a sense true, but is likely to mislead. The causation is complex, being somewhat as follows: Man by nature moves the tongue and other mouth parts to produce a great variety of sounds, and has pleasure in doing so. These movements, in connection with certain intellectual powers, can produce meaningful speech and language as an elaborate and flexible communicative art. But it is not at all certain that they *must* do so. Men with genes like ours have lived for hundreds of generations with little more language than the monkeys—with, for example, no words for eat, drink, mother, friend, yes, no, red, white, green, hot, cold, one, or two. They may have invented language as they invented tools of flint. A human family without language would seem hardly human in behavior, but its genes might be identical with ours.

EDWARD LEE THORNDIKE, *Man and His Works* (Harvard University Press, 1943), 19.

Central Reference File Committee On Education

DR. D. W. MORRIS, Secretary to the Association, suggested about a year ago to the Committee on Education that it would be highly desirable if the Committee were to keep an up-to-date file on the clinical facilities represented by the American Speech Correction Association in its membership. Council action was taken at the last convention on this matter and a questionnaire was developed which has now been sent to all members of the Association.

The questionnaire calls for certain specific information relative to the training and experience of the clinical personnel, the facilities available, and in a succinct way develops the type of information which is necessary for reference. It is intended to repeat this questionnaire each year so as to have an up-to-date central reference office for the Association. The Committee on Education will keep this information in its office and will use it in referring cases who write to the Association for help. A copy of the questionnaire shows that the Committee is attempting to avoid any jurisdictional questions on the matter, and the cooperation of the membership is appreciated. If, by any chance, any member has not received the questionnaire, copies will be sent upon request by the Committee. Please address inquiries, requests, or comments to the Chairman of the Committee.

Following is a copy of the letter accompanying the questionnaire, as sent to the members:

The Committee on Education's office, the president's office and the secretary's office have been receiving so many inquiries for help for the problem of speech defects and disorders, both from individuals requiring clinical services and from those wishing to enter the field, that it was decided at the last convention to set up a permanent file in the Committee on Education office for the purpose of answering adequately these inquiries. Our membership categories do not give us this information.

We are, therefore, enclosing two questionnaires. One or the other should be appropriate to your particular professional circumstance, perhaps both. Please fill out these questionnaires and return them at your earliest convenience, because we will now refer cases only to those who have completed the questionnaires and have returned them to this office, except in certain special circumstances which you can cover by letter.

The Committee on Education follows the By-laws fairly closely in making such references. It attempts to refer persons mainly to those with a professional level of standing where these persons are available. Then it follows the course of referring them to Clinical Members where Professional Members are not available and finally to Associate Members.

The questionnaire will permit us to have a more accurate reference service.

Committee on Education
MARTIN F. PALMER, *Chairman*
Address: Institute of Logopedics
Municipal University
of Wichita
Wichita, Kansas

JOURNAL OF SPEECH DISORDERS, 1945, 10, 275-282

Hearing Conservation At the College Level

Raida Dedomenico*

THROUGH THE cooperation of the Speech Clinic, the Departments of Speech, Student Health, Otolaryngology and Oral Surgery, and the Communication Skills Course in the College of Liberal Arts, hearing tests were administered to new students entering the State University of Iowa in the fall of 1944. Those students found to be hard of hearing were given additional examinations and services. It is the purpose of this report to describe this program and its results, and to indicate its implications with respect to the general problem of hearing conservation at the college level and in the college situation.

PROBLEM

THE PROJECT reported in this paper was oriented to the following questions:

1. What proportion of entering students, classified according to academic level, present a hearing loss, as determined by the sweep-check technique, when the criterion is that of a 15 decibel loss at two or more frequencies?

2. What are the characteristics of the threshold acuity audiograms of the students who present a hearing loss as determined by the sweep-check method?

3. What are the otological findings in those cases who present a hearing loss as determined by the threshold acuity method?

4. Of those freshmen students found to be deficient in hearing by the sweep-check or threshold acuity technique, what proportion are also found to be deficient in speech as determined by evaluations of staff members of the Department of Speech and the Speech Clinic?

5. On the basis of the University of Iowa Communication Skills Examination data, what differences are found between Freshman students who are deficient in hearing and those who are not?

6. In a comparison of Freshman students deficient in hearing with normal hearing Freshmen students matched as to race, sex, age and composite score from the State University of Iowa Freshman Examinations, what differences are found between these groups with respect to academic grades earned in university courses?

PROCEDURE

Testing Plan

A sweep-check audiometric test was made a part of the general physical examination required of new students entering the university at the beginning of the first semester of 1944-1945. The number of students

*Miss Dedomenico (M.A., Iowa) is on the staff at the Central Institute for the Deaf, St. Louis, Missouri. The study reported in this paper was done at the State University of Iowa with the cooperation and assistance of the staffs of the Departments of Otolaryngology and Oral Surgery, Student Health, and Speech; the Office of the Registrar; the University Examination Service; the Communication Skills Program; and the Speech Clinic. The author wishes to express her gratitude particularly to Dr. Harry K. Newburn, Professor E. C. Mabie, Dr. Dean M. Lierle, Dr. Chester Miller, Dr. Harry G. Barnes, Professor E. F. Lindquist, Dr. Paul Blommers, Dr. Scott N. Reger, Miss Patricianne Baldridge, Miss Bette Rae Bartell and Professor Wendell Johnson.

tested was 855.[1] After the physicians in the Department of Student Health had completed their examination, the students were escorted to the Department of Otolaryngology. There the audiometrist took them, in groups of from three to five, into a sound-proof room. They were seated comfortably and then given the following instructions:

> You are going to have your hearing tested. It is very simple and takes but a minute or two for each of you. You are to listen for sounds ranging from very low tones to very high shrill ones, like so: (A demonstration was given of the various sounds with the volume on full, so all could hear them at the same time.) Hold the ear phone up to your ear so that it fits snugly and comfortably, and listen very carefully. When you hear a tone, raise your hand, hold it up as long as you hear it, and lower it *immediately* when you no longer hear the sound, like so: (A demonstration was given with the volume on full so that all could hear and see how to respond.) Some tones will be louder than others, but most will be very, very soft. You must listen carefully and be alert. Ignore the clicking noises you hear. They have nothing to do with the test. As each student is tested, he sits in this chair next to the audiometer, with his back toward me. When he has completed the test, he returns to his seat and the next person comes up. We shall test the right ear first, and when I give the signal, change the ear phone to the left ear and we shall test that one. We will all remain in this room until all have been tested. Please be very quiet.

The Maico D-5 Audiometer was used for sweep-check testing. Theoretically perhaps the method of administering the sweep-check test would consist merely in setting the intensity dial at 15 decibels and determining those frequencies at which the audiometer tone is not heard by the subject. In actual practice, however, it is by no means that simple. With the intensity dial turned off, the frequency dial is set at 1024 cycles. Then the intensity dial is slowly turned up from –10 decibels until the student being tested raises his hand indicating that he hears the sound. This response is recorded and the intensity dial quickly turned off. This procedure is followed for the different frequencies in this respective order: 1024, 512, 256, 128; 1024, 2048, 4096, 8192. Rhythm patterns are carefully avoided.

Those students who showed a 15 decibel or greater hearing loss at two or more frequencies in the screening test were classified as hard of hearing for purposes of this program. In case of doubt, an individual threshold acuity test with the Western Electric 2-A Audiometer was given immediaately after the sweep-check test had been administered. All failing the screening test were given appointments for an otologic examination. Those who had colds at the time of the testing were asked to return as soon as their colds were cleared up, or within two months.

A few days before his appointment, each student was sent a card to remind him of it. Those who failed to appear at the set date were telephoned and reassigned another time, and were sent a second card to remind them of the new appointment in advance. To those who failed to appear the second time, a letter was sent through the Department of Student Health.

Otologic Examinations

First, a threshold acuity test was given to each individual with a Western Electric 2-A Audiometer. If the hearing loss recorded by means of the sweep-check was corroborated by the threshold acuity test, the student was sent to the Otolaryngological Clinic where he was given a thorough ear, nose and throat examination and the indicated medical treatment if the student was willing to cooperate.

Speech Examinations

The Speech Department staff gave every entering Freshman a detailed speech and oral reading rating during the early meetings of the Communica-

[1]Approximately 200 new students passed through the Department of Student Health before it was possible to get the hearing testing program underway.

tion Skills Course. One staff member rated each student. Those Freshmen who were thought to be in need of special attention were recommended to the Speech Clinic for a special examination. Two clinicians checked each student at this testing and made the diagnosis.

Scholastic Records

The scholastic records for the Freshman students used in this study were obtained from the Office of the Registrar. The grades A, B, C, D and F were transcribed into 4, 3, 2, 1 and 0 values, respectively. The composite grade point was computed as follows: Each grade value was multiplied by the number of credit hours earned in the course and the sum total of this result was divided by the total number of credit hours earned.

Selection of Control Group

Of the students found to be hard of hearing by the threshold acuity technique, 26 (all of whom were Freshmen) were compared in several respects with a control group of Freshmen with normal hearing. Each hard of hearing student was matched with two students with normal hearing on the basis of race, sex, age and composite score on the State University of Iowa Freshman Examinations. Essential information concerning these examinations is here presented:

1. The major purposes of the Freshman Examinations given at the State University of Iowa are:
   a. To provide a more adequate basis for educational and vocational guidance.
   b. To assist in the appropriate placement of entering students in the pattern established by recent curricular revisions.
   c. To provide information which in certain areas may help instructors better to adapt their teaching to the needs of the student.
2. The nature of the tests is:

Test 1 measures correctness and effectiveness of expression in written language.

Tests 2, 3 and *4*, in the Social Studies, the Natural Sciences and the Humanities, respectively, are of a type that require the student to interpret and evaluate a number of reading selections representative of those he will have to read and study in subsequent school work.

Test 5, covering general mathematical ability, is a test of general problem solving ability of a very practical sort.

Test 6 is a general vocabulary test.

Test 7, a reading rate test, differs from the usual rate test in that it measures rate of *comprehension* rather than merely rate of looking at words.

3. Interpretation of test results:

The quality of an individual's performance on each of the tests and on the battery as a whole (Test 7 excepted) is expressed in terms of standard scores and of percentile ranks for all entering Freshmen. The *percentile* rank of a given individual's score represents the *percentage* of individuals in the total group whose scores fall below his score. The percentile ranks given in the official report of the Examination Service Office and used in this study are based on entering Freshmen only. The scores used in this study were percentile ranks based on composite scores of performance on Tests 1 to 6, inclusive.

RESULTS

AS SHOWN in Table 1, 68 (or approximately 8 per cent) of the 855 students tested by the sweep-check method (Maico 2-A Audiometer) presented a loss of 15 decibels or more for two or more frequencies. Of these, 12 did not report back for further testing. Also, of the 68, there were 14 who had colds at the time of the first test. Of these 14, only two were found to be hard of hearing on a subsequent test. Of those who did report back, 34 were found to have the hearing losses summarized in Table 2. These losses were determined by the threshold acuity method (Western Electric 2-A Audiometer). As shown in Table 2, the median decibel losses, of those who showed losses at each frequency, were somewhat greater for the higher frequencies than for the lower, particularly for the right ear. The median loss for the better ear ranged from 20 to 35 decibels. Twenty-five per cent had losses for the better ear ranging for the various frequencies from 30 to 55 decibels.

TABLE 1. Number and percentage of entering students failing the sweep-check hearing test. Failing the test involved a 15 db. loss at two or more frequencies.

Classification	*Number of Students in Class*	*Number of Students Failing Test*	*Percentage of Class*
Freshmen	624	49	8.0
Sophomores	69	5	7.3
Juniors	83	5	6.0
Seniors	6	2	33.3
Graduates	60	7	11.7
Unclassified	13	0	0.0
TOTAL	855	68	8.1

TABLE 2. Number of subjects showing hearing loss at each of seven frequencies in right and left ears, with median and quartile hearing loss values for each frequency. N=34. Threshold acuity determinations made with 2-A Western Electric Audiometer.

Decible Loss	128		256		512		1024		2048		4096		8192	
	R.E.	*L.E.*	*R.E.*	*L.E.*	*R.E.*	*L.E.*	*R.E.*	*L.E.*	*R.E.*	*L.E.*	*R.E.*	*L.E.*	*R.E.*	*L.E.*
X (no response) ..	2	1	....	....	....	....	....	....	....	1	2	2	7	6
No. showing loss..	10	9	11	10	14	15	14	16	15	17	28	29	26	29
Median db. loss ..	30	20	30	25	30	25	25	20	40	25	45	35	50	30
Q_1 db. loss.....	50	30	45	35	35	30	35	35	60	35	65	55	X	50
Q_3 db. loss.....	25	15	25	20	20	15	25	20	20	15	30	20	35	20

TABLE 3. Medical diagnoses for each hard of hearing student who completed otologic examination.

Case No.	*Diagnosis*
1	Acoustic neuritis, bilateral Inner ear involvement Faucial tonsil tags Chronic pharyngitis Chronic cervical lymphodenetis
2	Acoustic neuritis, bilateral Inner ear deafness, bilateral Chronic faucial tonsilitis
4	Chronic hyperplastic otitis media, bilateral Middle ear deafness, bilateral
5	Deflected septum Septal spur Hyperplastic otitis media, bilateral Middle ear deafness, right
6	Acoustic neuritis, bilateral Inner ear deafness Chronic faucial tonsillitus (tags), bilateral Chronic rhinitis Mild hyperplastic max. sinusitis

TABLE 3 (Continued)

Case No.	*Diagnosis*
8	Septal deflection to left Chronic cervical lymphodids Middle ear involvement Adenoids
10	Acoustic neuritis, left Middle ear deafness, left Inner ear deafness, left External otitis media, left
12	Acoustic neuritis, bilateral Inner ear deafness, bilateral Chronic faucial tonsillitis Hypertrophied adenoids
14	Chronic faucial tonsillitis Chronic rhinitis Chronic sinusitis Inner ear deafness, bilateral
15	Chronic rhinitis Acoustic neuritis, bilateral
18	Chronic hyperplastic otitis media, left Middle ear deafness, left Acoustic neuritis, right Inner ear deafness, right Acute coryza
20	Nasal deflection to right Chronic faucial tonsillitis Chronic cervical lymphadenopoly
23	Deflection of septum Chronic faucial tonsillitis, left
25	Acoustic neuritis, bilateral Inner ear deafness, bilateral Septal deflection Chronic lingual tonsillitis
26	Septal deflection Chronic laryngitis (tobacco)
28	Chronic non-hyperplastic otitis media, right Middle ear deafness, bilateral Hypertrophied adenoids
29	Deflected nasal septum, post-traumatic, to left Atrophic rhinitis r. early Hypertrophic rhinitis l. early Inner ear deafness
30	Chronic faucial tonsillitis Acoustic neuritis, bilateral Chronic hyperplastic otitis media, bilateral
31	Chronic non-sup. otitis media Chronic faucial tonsillitis
32	Chronic hyperplastic otitis media, right Middle ear deafness, right Acoustic neuritis, bilateral Inner ear involvement, bilateral Residual adenoid tissue
34	Vasomotor rhinitis Chronic faucial tonsillitis Mild chronic cervical lymphadenopoly Chronic intermittent recurrent otitis media, right Middle ear deafness, right

Medical findings for the 21 students for whom it was possible to obtain such data are summarized in Table 3. In all of the 21 cases who completed the medical examinations there were positive findings. Special medical recommendations consisted of tonsillectomies, adenoidectomies, allergy skin tests, sinus X-rays and mastoid films.

TABLE 4. Scholastic record in composite grade points: mean scores, standard deviations, ranges and critical ratio for the experimental and control groups:

	Mean	*S.D.*	*Range*
Experimental Group	2.227	.666	0.640 to 3.777
Control Group	2.238	.672	1.000 to 3.615
Critical Ratio	0.07		

SIX of the 34 students found to be hard of hearing on the follow-up threshold acuity tests presented speech defects enough to warrant treatment in the Speech Clinic. In Case 1, the speech disorder was that of stuttering and was probably not functionally related to the hearing deficiency. In Case 26, the hearing loss was not severe enough to have any significant influence on the articulation defect. In Cases 5, 12, 14 and 34 the voice and articulation defects were, so far as could be determined, related to the degree of hearing impairment. There were 18 other cases who presented apparently significant hearing losses in the 'speech range,' 128 to 4096, who presented no speech disorders.

For all practical purposes, the experimental and control groups were matched perfectly as to Iowa Freshman Examination scores and chronological ages. The mean age of the experimental group was 18.5 years and of the control group 18.2 years. The mean composite percentile rank on the Freshman Examinations was 55 for both groups. Table 4 shows that there was no significant difference between the two groups as to scholastic record in composite grade points.

As shown in Table 5, there is a significant difference between the two groups in the articulation performance in the speech and oral reading tests given at the beginning of the fall semester in the Communication Skills Course. (It was on the basis of these tests that students were referred to the Speech Clinic for more detailed examination.) The hard of hearing students received lower mean ratings for articulation in speaking and in oral reading than did the normal hearing group. Table 6 verifies this point with a more detailed analysis showing that a greater percentage of the hard of hearing group presented substitution, slighting, omission, general inaccuracy and pronunciation errors than did the normal hearing group. Of the experimental group, 11.5 per cent were recommended by the Speech Department

TABLE 5. Ratings of voice and articulation, on a scale of 1 (defective) to 9 (superior): mean scores, standard deviations, range and critical ratio for the experimental and control groups.

Criteria	*Experimental*			*Control*			*C.R.*
	Mean	*S.D.*	*Range*	*Mean*	*S.D.*	*Range*	
Voice							
Speaking	4.2	1.3	2–7	4.8	1.7	0–8	1.70
Oral reading	4.2	1.2	2–7	4.8	1.6	0–8	1.87
Articulation							
Speaking	4.1	1.2	2–7	5.2	1.4	0–8	3.62
Oral reading	4.0	1.3	2–7	5.0	1.5	0–8	2.99

staff for clinical examination in articulation while none of the control group was thought to be in need of this special examination. As indicated in Tables 5 and 6, there were group differences also with respect to voice ratings and analyses, but they were less marked than those with respect to articulation.

TABLE 6. Detailed diagnostic record of speech performance with respect to voice and articulation: percentages of students judged to present each characteristic. N for experimental group=26. N for control group=52.

Characteristic	*Percentages*	
	Experimental	*Control*
Voice		
Loud	3.8	0.0
Weak	11.5	21.2
Fast	15.4	13.4
Slow	7.7	1.9
High pitch	7.7	3.8
Low pitch	7.7	5.8
Monotonous	23.1	15.4
Nasal	19.2	5.8
Shrill	3.8	0.0
Hoarse	11.5	1.9
Breathy	15.4	15.4
Blocking	3.8	1.9
Patterns	7.7	15.4
Articulation		
Substitutions	3.8	1.9
Slighting	26.9	11.5
Omissions	7.7	0.0
General inaccuracy	11.5	5.8
Pronunciation	23.1	9.6
Dialect	0.0	0.0

The control group presented a somewhat better record than did the experimental group for the first semester in the Communication Skills Course. This is shown by the fact than 9.6 per cent of the control group and none of the experimental group performed sufficiently well on preliminary examinations to be exempted from the course, and the further fact that 3.8 per cent of the experimental group and none of the control group failed the course.

SUMMARY

A TOTAL of 855 entering students at the State University of Iowa in the fall of 1944 were tested with respect to hearing acuity by means of the sweep-check technique using the Maico D-5 Audiometer. Of these, 787, or approximately 92 per cent, were found to have normal hearing and 68, or approximately 8 per cent, were suspected of having a hearing loss (14 of these had severe colds at the time of testing).

Of these 68, 12 failed to report back for a detailed threshold acuity test (Western Electric 2-A Audiometer); 34 were found to have a hearing loss with the threshold acuity method, and of these 34, 21 completed an otologic examination. For all of these 21 hard of hearing students some positive medical findings were reported by the examining physicians.

A group of 26 hard of hearing Freshmen, included in the above total group of 34, was matched as to race, sex, age and Freshman Examination scores with a control group of 52 normal hearing Freshmen (2 normal hearing students for each hard of hearing student), and were compared as to speech performance and scholastic record for the fall semester of 1944.

Significant differences were found between the two groups in the ratings for articulation in speaking and oral reading, and less marked differences were found with respect to voice. The hard of hearing students presented misarticulations to a significantly greater degree, as rated, than did the normal hearing students.

Other comparisons did not reveal marked differences between the two groups, although the control group made a slightly better record in the Communication Skills Course, fall semester, than did the hard of hearing students.

DISCUSSION

THIS STUDY indicates in some measure the broad outlines of the hearing conservation problem at the college level, although, of course, generalization is to be limited to comparable populations and situations. Insofar as the findings are representative, they indicate that roughly 4 per cent of university students present medically significant degrees of hearing loss. On a national basis, as well as for any particular college or university, this implies a hearing conservation problem of considerable dimensions. The educational significance of the hearing impairments, however, was not shown in this study to be of general importance. It is possible, of course, that in particular areas of academic study the hard of hearing students are handicapped in ways not revealed by this investigation —as, for example, in learning to speak foreign languages.

With respect to speech impairment associated with hearing loss, relatively few cases of voice and articulation defects of clinical significance were found among the hard of hearing students. Due note is to be taken, however, of the fact that the hard of hearing students were judged to be generally inferior to the control group of students with normal hearing with respect to voice and articulation in speaking and oral reading performances under classroom conditions. This could be taken to indicate that while the speech impairment had reached clinical proportions in but few cases, nevertheless the beginnings of speech impairment, possibly progressive, were present in many cases. Further investigation at the college level should be directed to this possibility.

NOTE FOR BE-KIND-TO-CONTRIBUTORS-TO-THE-*JOURNAL* WEEK

There may be no such thing as brain fag but thinking is done with the whole body, and sixteen hours at a desk composing in words or notes is an ordeal that few strong men not trained to it could withstand. As Shaw has pointed out, his kind of life would cause an instant strike among the navvies. The more important point is that the brain worker is like everyone else dependent on his neighbor's tolerance. . . . The crudest boor would not jog the elbow of a man pouring water into a beaker, and yet the operation is probably far less important than the search for the right word done by a motionless man with a vacant stare on his face. The man who is reading or writing or imagining is so much more vulnerable that he who has not had a thread of thought broken does not know the full meaning of frustration nor the strongest temptation to murder. . . . The author lacks sufficient stretches of time to himself. Unless he can afford a room of his own at home, he must write in the library and here new obstacles offer. Composing in the general reading room is difficult if not impossible. Cubicles available in some libraries are private but lack all atmosphere . . . you cannot consult, roam, or grope your way to the heart of your subject. . . . Mark Twain very sensibly preferred to write in bed, and I am happy to know that William James, writing in a public hotel room a hundred and twenty feet long, calls it "just about the right size for one man."

JACQUES BARZUN, *Teacher in America* (Little, Brown, 1945), 302-306.

JOURNAL OF SPEECH DISORDERS, 1945, **10**, 283-286

A Screening Survey of Organic Impairment

Manuel Sall*
Joseph M. Wepman

THE concentration of the head traumas in a few selected Army neurological and neurosurgical centers in the United States has resulted in the definite need for a rapid survey of intellectual impairment consequent to brain injury. For this reason it is imperative that an estimate of ability be obtained in all brain injuries as an aid to the medical officer in his evaluation of the following problems:

1. Can the patient return to duty?
2. Does the patient need educational therapy?
3. Is vocational guidance required and what type of recommendation is to be made to interested Army and civilian agencies for patients awaiting discharge?

There are many standardized tests available to assist in obtaining information relative to these questions. Although a number of these tests were tried at this installation (Army Service Forces, Ninth Service Command, DeWitt General Hospital, Auburn, California), none of them fulfilled our need for a complete and rapid survey of the intellectual and performance disabilities incident to brain trauma. Certain of these tests are utilized to obtain more detailed information about those patients screened and found impaired by our survey. Among the useful tests the Army-approved Wechsler-Bellevue Intelligence Test was found to be very satisfactory but much too lengthy to suit our purpose. It has for this reason been reserved to measure the more seriously impaired patients. It is used to confirm and define those cases where more exact and complete information about the degree of lost ability is important. The Halstead Aphasia Test is used to define the areas of language impairment suggested by our screening survey. It has been found to serve an excellent purpose in this respect. Koh's Block Design Test has been found to be extremely useful in describing the non-language ability of patients. We use it whenever a non-language estimate of intelligence is required.

Of less value to us were the tests which are called short form tests of impairment. The Shipley-Hartford Retreat Scale, while found to be useful in measuring abstraction loss, tests only this ability. Since abstraction is only one of the problems presented it was not thought to be inclusive enough for our general purpose. In its use here, on well over 200 patients, it was found to correlate only partially with clinical neurological judgment or with more exhaustive measurements of impairment. Its major weaknesses, other than its comparatively limited area, are the quite restricted pre-traumatic range of intelligence that it can measure successfully and the inability to obtain any judgment on problems involving visual, verbal or coordinative abilities. It was of special interest to us at an army installation, where there was a wide sampling of adults of both

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high and low pre-traumatic ability, that the test was applicable to only those whose former intellectual levels[1] were in the average adult class. Many of the test items were much too difficult for those with limited intellectual capacities. The Hunt Clinical Test for Organic Brain Damage was found to approximate most closely the type of test we desired, but after a considerable trial it, too, was found to have several basic weaknesses for our particular situation. Hunt's test attempts to quantify on the basis of its short form a total opinion about an individual's potentialities without actually measuring all of his abilities. To obtain the desired quantification for standard statistical data, the test sacrifices certain areas which are not easily quantified. In its short form it leans too heavily on simple visual form perception and word-pair recognition in arriving at a total impression of the impairment shown by the patient. In its attempt to arrive at a proper statistical statement it becomes too rigid and inflexible for clinical use in measuring the varied types of difficulties presented by the cerebral traumas.

The authors recognized the shortcomings of the available tests as well as the difficulties involved in measuring comparatively large numbers of patients in a short time for a wide variation of difficulties. Consequently the following requirements were set down as being essential in arriving at a rough but practical working estimate of each individual case. First, the test must be short. Not over twenty minutes should be necessary to arrive at a gross judgment about each patient. Secondly, since time was a distinct element and a short form necessary, qualitative rather than quantitative judgments were deemed essential. It was considered valid that a qualitative final opinion should be arrived at as much as possible on objective data. Subjective material, however, should be included wherever it would be of aid in arriving at the best possible conclusion. The estimate of impairment, then, would have a quantifiable base whether it was ever expressed in figures or not. Third, the distribution of pre-traumatic intelligence in our patients was found to be as varied as is the intelligence in the total population. It was therefore recognized that the survey must be so designed that both high and low pre-traumatic intellectual potentials could be measured. Fourth, the type of abilities to be examined would include all of the possible variations of intellectual and language functions. This made it necessary to include a measurement of the following abilities:

a. To think abstractly.
b. To concentrate and be attentive.
c. To recall immediate, recent and past personal events.
d. To recall and perform with comprehension, graphically, orally, aurally and visually.

Fifth, since post-traumatic impairment can only be measured against some estimate of pre-traumatic ability, the survey must be able to make some approximation of the patient's previous intellectual ability.

IN ORDER to meet the foregoing requirements, a group of almost fifty items were tried and eventually a short survey of nine selected items were chosen.

Item I. *Pre-morbid intelligence*

To estimate the patient's pre-traumatic intellectual ability three sources of information were considered. First, vocabulary age. The practical and widely adopted belief that the least sensitive ability to brain injury is the patient's vocabulary level was accepted. In the literature, Wechsler, Rappaport, Shipley and others all attest this belief. For our test we use the vocabulary age obtained by administering the Stanford-Binet, 1937, Vocabulary Scale. Secondly, objective data from the patient's army record. Whenever this information is available it is utilized. In most instances it consists of the patient's Army General Classification Test and Mechanical Test

[1] In most cases obtained from Army General Classification Tests.

scores. While these may not be accurate measurements of intelligence, they furnish useful data about the pretraumatic ability of the patient. The third source is the patient's educational and vocational achievement. This is subjective information gathered from the service record. Practical and qualitative material of this nature we find to be very valuable in forming our opinion about the patient's pre-morbid life. With this three-fold information before us the following areas of the patient's present ability are investigated.

Item II. *Personal memory*
Test: Immediate, recent and past recall of personal events.
Source: After Wells, H. E., Memory Test.

Item III. *Visual form perception and memory*
Test: Design Recall, four forms.
Source: Original designs based on Memory for Design Test in Stanford-Binet, Form L.

Item IV. *Auditory memory and concentration*
Test: Digits forward and reversed.
Source: Original series based on Wechsler Mental Ability scale and others.

Item V. *General abstraction*
Test: Serial 7 subtraction from 100.
Source: Origin unknown; an accepted test in use by many neuropsychiatrists.

Item VI. *Visual memory*
Test: Recall of pictured objects.
Source: War Department Pamphlet No. 12-9, *Handbook for Clinical Psychologists.*

Item VII. *Visual size perception*
Test: Rearrangement of designs.
Source: Original design series (Wepman).

Item VIII. *Visual perception with recall and comprehension*
Test: Reading paragraph with eight memories.
Source: Original paragraph (Wepman).

Item IX. *Hand-eye-ear coordination*
Test: Writing from dictation.
Source: Original sentence (Wepman).

The qualitative differential between the past intellectual ability as determined by Item I and the present abilities as determined by Item II through IX is the basis used for our determination of impairment. The test items are administered without reference to timing and without arriving at any absolute quantified score. A qualitative opinion is derived by the clinical psychologist. Definite consideration is given to the patient's approach to each problem, the speech used, the conceptual level of the answers and the rapport gained. During the test there is sufficient verbalization to allow for an estimate of any basic speech difficulty as manifested by blocking, repetition, perseveration, or poor articulation. The clinical judgment of impairment is arrived at not only from total performance but in each area individually. The medical officer is then given an opinion in terms of either generalized impairment, slight, medium or marked; or specialized impairment in vision, audition, speech, memory, or coordination or any combination of these abilities. Recommendations are made concerning indications for therapy.

The survey has been in use at this installation for the past three months in its present form. During that time over 200 patients have been examined by means of it. Over 100 of these have been measured by other tests like the Wechsler-Bellevue, the Stanford-Binet or Koh's Block Design Test. There has been an excellent correlation (nonstatistical) between the clinical judgment of the psychologist and the other tests. In addition, as a further check the test has been found to agree in almost every instance with the neurologist's opinion arrived at following his examination and a series of interviews. From the test results have come some definite outlines for therapy, the discovery of minor defects of language which would respond to therapy and which ordinarily would have been overlooked, and some very suggestive clues as to how to advise patients about to be discharged.

With the development of an Aphasia Center at this hospital and an increasing number of head injured patients that show language disturbances, the organic survey has proved itself an excellent first step in the con-

sideration of the aphasic patient. In a study now in preparation it is planned to show the type of care that is given to these patients following their initial survey with this test.

It is the opinion of the authors that the screening survey discussed in this paper serves a valuable function and adds considerably to the physician's knowledge of his patients. With only a brief expenditure of time each head-injured patient is evaluated and either considered for further study, recommended for therapy, or considered for discharge and given vocational guidance.

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LANGUAGE AS STRUCTURE

As speech is observed in everyday life, it is a congeries of individual languages differing with the intellectual capacity, the training, and the experience of the person using it. Every language used by a people has its own characteristic framework of established distinctions, its shapes and forms of thought into which, for the one who learns that language as his "native tongue," are cast the contents of his mind, his mass of acquired impressions, and his knowledge of the environment. This is brought about as a result of external influence; it is imposed from without, and is associated with the process by which the individual acquires the material of expression itself. It is not a product of his free, undirected internal forces; his mind has been led to view things and to group them in certain ways and to contemplate them consciously in those particular relations.

The structure of even the most elaborate languages, rich in expressions, embodies and brings to consciousness or awareness only a small part of the great wealth of relations existing among the objects of thought and recognized impliedly, within, although no attention is directed to them by expression.

Although man possesses various faculties and capacities which integrate in a manner allowing for and leading inevitably to the production of thought and speech, these capacities are one thing and their elaborated complicated products are another. Men are not born artists, engineers, or speakers, but are made so, in large part, by their human contacts. Language is a type of social action which was developed by man in his relations with other men. The aim and function of the verbal expression is the transmission of some thought or feeling pertinent to the moment and in the midst of a present situation. Utterance and situation are bound up intimately with each other, and the meaning of the situation must be known for the words to be understandable. Thus language is a function of the situation and must be so interpreted if an investigator is ever to approach and understand such things as unconscious motives.

J. S. KASANIN, *Language and Thought in Schizophrenia* (University of California Press, 1944), vi-vii.

JOURNAL OF SPEECH DISORDERS, 1945, **10**, 287-291

Speech Disorders In World War II: III. Dysarthria.

William G. Peacher*

INFORMATION concerning the incidence and management of speech disorders in World War II has been previously reported by the present writer (**5**, **6**). These investigations were first instituted on the Neurosurgical Section at Brooke General Hospital, Fort Sam Houston, Texas on May 7, 1943, concluding on February 20, 1945, when the writer was transferred to McGuire General Hospital, Richmond, Virginia. Further studies at the latter installation are now in progress.

The various types of speech disturbances observed included dysarthria, dysphasia, dysphemia, dysphonia and dyslalia. The dyslogias have not been mentioned as they are not pertinent to a study of this type. Minor changes have been made in the previous classification to meet individual circumstances. These disorders and their rehabilitation have been poorly understood and largely neglected by the majority of the medical profession. Interest has centered mainly on the classification and routine examination of the dysphasias.

Both pre- and post-induction defects have been included, particularly those sustained in, influenced by, or resulting from exposure to combat circumstances. In the earlier reports, only 18 per cent of the cases fell into the latter group, but the statistics have had to be frequently revised due to increase in numbers of casualties received in recent months.

Loebell (**4**) described 200 patients with voice and speech disturbances treated at the Munster Military Hospital during a six months period beginning in October, 1939. The majority were admitted with a diagnosis of 'laryngeal catarrh, hoarseness or loss of voice,' and were subsequently classified in the following manner:

1. Acute or subacute laryngitis—23
2. Chronic laryngitis with functional voice disturbance—89
3. Functional voice disturbance—26
4. Hysterical aphonia—16
5. Tumors of the vocal cords and paralysis (exclusive of injuries)—23
6. Trauma of the larynx—5
7. Speech disturbances—18

The group of speech disturbances was not fully covered, only one post-encephalitic and one motor dysphasic being mentioned. The paper is primarily concerned with the management of the men with disturbances of voice.

The Surgeon General's Office has recently released a training bulletin (**1**) outlining and organizing for the first time the management of dysphasia cases encountered in the Service. No special center has been authorized for rehabilitation. Rather, the responsibility has been delegated to the combined efforts of the neurological and neurosurgical sections in general hospitals so designated for these specialties. Speech re-education is included in the daily training program. Psychological examination in addition to the routine neurological survey is empha-

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sized in these studies. Weisenberg and McBride's (7) classification is given and is valuable for descriptive purposes but has not supplanted the old terminology in general use (motor, sensory, amnesic and mixed dysphasia). Long term rehabilitation is emphasized until maximum benefit of hospitalization has been attained. If discharge from the Service is then indicated for various organic residuals, specially designated Veterans' Administration facilities have been specified for further re-education as indicated.

Programs of this type are now being organized at several of the other Army General Hospitals. Only one brief paper has thus far appeared. During the initial three months period at Percy Jones General Hospital, Backus (2) states that 12 to 15 aphasics were studied. Methods of rehabilitation were outlined and conform to those in general use for cases of this type. A similar plan is being carried out at the Philadelphia Naval Hospital, but no reports are as yet available from this source.

PREVIOUS communications from this clinic were concerned largely with classification, incidence and management of speech disorders as a whole. The importance of rehabilitation was emphasized. Sufficient numbers of cases representing each individual defect have now been studied so as to warrant separate publication. This paper is concerned with the dysarthrias as observed during Army service. They represent a very interesting phase in the study of language disturbances which result from a lesion of the central or peripheral nervous systems. The anatomical conceptions of this condition are fairly well understood and a brief classification in this respect is now given:

Central Nervous System:
1. Pyramidal tract
2. Extra-pyramidal system
3. Fronto-ponto-cerebellar tract with its many association pathways

Peripheral Nervous System:
Cranial Nerves
1. Trigeminal, motor branch — when present alone, usually does not produce significant symptoms
2. Facial—peripheral in type
3. Hypoglossal

Reports prior to the war were largely concerned with the various types of dysarthria as associated with pyramidal and extra-pyramidal tract lesions commonly observed in childhood. The incidence has been recorded as high as 75 per cent and routine re-education has been stressed. There are no comparable statistics on the articulatory disorders based on the cases seen during World War II other than already recorded from this section. Although there are many variable factors to be sure, such as age of onset, type of pathology, extent of the lesion, educational background, etc., the facts are inescapable that lesions of the central nervous system (particularly involving the pyramidal and extra-pyramidal systems) rarely cause dysarthria. These figures are even more significant when traumatic cases alone are considered. In the latter respect, a large number of cranio-cerebral injuries sustained in theaters of operations are being observed here, many with localizing signs, but the majority give no history of speech disorder earlier in their course and all speech tests have been within normal limits. It is of course possible that minor language changes were present for a short time after the acute injury which were forgotten by the patient or overlooked by the medical examiner. At least, few positive histories have been obtained and medical field records are notably deficient in this respect. This is understandable in view of the stress and strain of battle circumstances when minor speech defects are of minimal consequence to life-saving medical and surgical procedures.

Dysarthria of central origin when present is uncommonly seen as the only presenting symptom and has usually been observed in association with

other neurological signs, e.g., hemiplegia, dysphasia, parietal lobe findings, etc. Those cases in association with dysphasia will be discussed in a later paper on this subject, and when present almost always need re-education. These were not included in the statistics given in this paper, as it was felt that the difficulty in expression constituted the main problem. An occasional central weakness of the facial nerve will interfere with the labials and labio-dentals. Peripheral nervous system lesions involving the seventh and twelfth cranial nerves in that order of frequency most commonly produce dysarthria. Trauma to the facial nerve is often associated with symptoms of vestibular or cochlear dysfunction when due to basilar skull fractures which are relatively common. Penetrating maxillo-facial and parotid wounds also may result in paresis of this type. Hypoglossal lesions are occasionally seen following gunshot wounds of the neck and frequently improve after operation. On the whole, however, adequate spontaneous improvement with compensation prior to transfer has been attained in peripheral seventh and twelfth nerve paralyses in spite of complete lesions presenting on examination. Only occasionally will re-education be indicated in cases of this type. Involvement of the motor root of the trigeminal nerve has not been observed to result in positive symptoms in this series.

An etiological classification is similarly useful in a study of this type and is also given as it pertains to the cases in this report. A few minor changes have been made in the grouping of the individual cases that were previously recorded.

Dysarthria—100
- I. Central Nervous System—31
  - 1. Cerebrum—22
    - Cranio-cerebral injuries—10
    - Post immunization encephalopathy—2
    - Tumors—2
    - Parkinson's disease—2
    - Post-partum encephalopathy—1
    - Multiple sclerosis—1
    - Paresis—1
    - Sulphonamide sensitivity—1
    - Thrombosis, rt. innominate artery—1
    - Cerebro-vascular disease—1
  - 2. Cerebellar—5
    - Cranio-cerebral injury—1
    - Tumors—4
  - 3. Bulbar—4
    - Syringomyelia—1
    - Poliomyelitis—1
    - Polyneuritis—1
    - Tumor—1
- II. Peripheral Nervous System—69
  - 1. Peripheral facial paralysis—60
    - Traumatic—31
    - Spontaneous—15
    - Post operative—9
      - Parotid tumors, calculi—5
      - Trigeminal neuralgia—1
      - Mastoidectomy—2
      - Meniere's disease—1
    - Tumors—3
    - Geniculate neuralgia—1
    - Post-injection—1
  - 2. Hypoglossal paralysis—9
    - Traumatic—6
    - Inflammatory—1
    - Tumor—1
    - Post-operative
    - Arterio-venous aneurysm—1

ONE of the cases of dysarthria of central origin will now be presented in greater detail.

Case I:

Mode of injury—Patient is a 23-year-old white soldier who sustained a penetrating wound due to shell fragments as a result of enemy action, February 25, 1945. Point of entry was just inferior to the internal canthus, OD. X-rays of the skull showed the foreign body measuring 1.5 cm. to be lodged intracranially 5 cm. superior and 2 cm. posterior to the sella turcica, 3 cm. to the left of the midline. This is shown in Figure 1. There were no associated injuries other than incidental to the above wound and no demonstrable cranial fractures.

Course and Residuals—Positive neurological findings revealed: diminished vision, O.D.; weakness medial rectus O.D.; central weakness of the right facial nerve. There was also apraxia, astereognosis and weakness of the right upper extremity. The deep reflexes were increased and the superficial reflexes diminished on the right. There was a right Babinski response. All the above findings had disappeared on the initial examination here and again three months later. Visual fields and acuity as well as

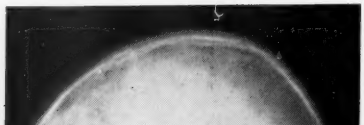

FIGURE 1. Left lateral X-ray of the skull shows the shell fragment measuring 1.5 cm. to be lodged 5 cm. superior and 2 cm. posterior to the sella.

extra-ocular movements were normal on these occasions.

Speech—Detailed medical records were not available other than the statement, 'Dysarthria was present rather than dysphasia.' The patient, however, could give sufficient details to diagnose accurately his previous disorder. In his own words: 'I could say some words but just couldn't say them plain. My pronunciation was poor and I talked too fast.' Comprehension was preserved and there was no evidence of any of the dysphasias. These symptoms gradually improved over a period of two months and when transferred here from an overseas theater, routine tests for dysarthria revealed no residual disturbance.

Encephalogram was performed on May 30, 1945. There was no change in filling of the subarachnoid spaces. There was slight dilatation of the anterior horn and proximal portion of the body of the left lateral ventricle. This is shown in Figure 2.

Electroencephalogram was recorded on July 6, 1945. The dominant rhythm was nine per second. The amplitude was within normal limits and there was no asymmetry. There were no abnormally slow or fast waves present or other evidence of focal pathology. During hyper-ventilation there was an occasional paroxysmal burst of six to eight per second waves which was present in all leads.

Disorders of articulation were commonly characterized by distortions, exaggerations and misrepresentations of the usual speech tests. There were in addition often omission of syllables and entire words, sound substitutions and less frequently additions. Routine examination consisted in testing the individual sounds, followed by words containing these sounds in the initial, medial and final positions. Further information was obtained by carefully observing spontaneous speech, repetition tests and oral reading. A careful phonetic analysis was recorded in each instance to direct rehabilitation, determine improvement and compare results.

Treatment—1. Psychotherapy. Each case represents an individual problem in this respect. The patient must be given an insight as to the nature of his condition, taught how to relax and be encouraged as training continues. Occasionally functional disorders are also present and these are eliminated when and where possible.

2. Physiotherapy. The usual principles apply depending upon the type of lesion present. For example, a case of facial paralysis often responds to heat, massage and daily electrical stimulation during nerve regeneration. The treatment of associated conditions (hemiplegia, etc.) must not be neglected.

3. Remedial surgical problems must be clarified if possible prior to speech training. Accessible lesions of the seventh and twelfth cranial nerves may need neurolysis, anastamosis, or other cosmetic procedures as indicated depending upon the etiology and site of pathology. The treatment of accompanying neurological and physical defects should not be overlooked, as suggested above.

4. Occupational therapy and other phases of physical, mental and educational rehabil-

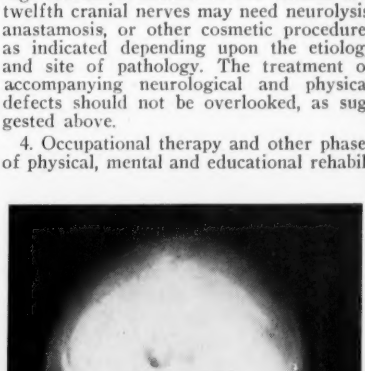

FIGURE 2. Antero-posterior X-ray of the skull following encephalography shows slight dilation of the anterior horn and proximal portion of the body of the left lateral ventricle.

itation have been correlated with all convalescent programs at Army installations with marked success.

5. Speech exercises. The correct mouth moulds are taught with compensatory movements as necessary in the event of unimproved cases of paralysis. Individual sounds must be produced first in isolation and then gradually strengthened, and ultimately included in spontaneous speech. The motokinesthetic method may also be necessary.

6. Disturbances of rhythm are occasionally seen. These cases must be taught to speak slowly, in a low pitched voice and with little effort. Exercises to improve rhythm, including music, often result in further advancement.

7. Substitutive compensation by means of associated kinaesthetic processes are used in some of these cases, but are more valuable in the dysphasias.

8. Breathing exercises are given as indicated.

9. Length of training period will depend upon the individual problem presented and associated pathology. In general, they should start at 10-15 minutes and then be gradually increased according to tolerance and time available to one half-hour twice daily.

10. The exercises recommended by Froeschels (**3**) no doubt have their place in training patients of this type but have not been extensively employed. These include: jaw shaking, chewing and pushing exercises and the use of corks of varying sizes to strengthen the labial muscles. Additional methods have been instituted to improve the tone of the musculature of the tongue and palate.

SUMMARY

CASES of dysarthria constitute 25.31 per cent of all patients studied with speech defects at this hospital. One hundred soldiers have thus far been observed with this complaint, 69 per cent of the cases representing lesions of the peripheral nervous system. Of the latter, 86.95 per cent were due to pathology involving the facial nerve. Symptoms usually depend upon the location and severity of the lesion. When due to a supra-tentorial lesion, disorders of articulation are usually associated with other neurological signs, such as dysphasia, hemiplegia, astereognosis, etc. It is surprising, however, that cases of dysarthria are so infrequent in view of the high incidence of penetrating cranio-cerebral wounds with frontal, parietal and temporal lobe damage. This is interesting in view of the marked frequency of articulatory disturbance of the pyramidal and extra-pyramidal systems commonly observed in childhood. Many other factors are involved, however, in the latter, making the problem understandable.

Rehabilitation is usually indicated in those cases with central nervous system involvement, but only occasionally in peripheral lesions as adequate compensation is attained early in these disorders. Return to duty is usually possible in most cases of dysarthria in absence of other disqualifying neurological or physical residuals. The various methods of examination and treatment are further briefly outlined.

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News and Announcements

Miriam D. Pauls, Editor*

AS A RESULT of recent legislation, a state-wide program for the re-education of children handicapped in speech and hearing has been made possible in Ohio. The direct administration of the program has been delegated to Mrs. Hazel C. McIntire, Director of the Division of Special Education.

Dr. Ruth Beckey Irwin, formerly of Ohio University, has been appointed to the position of Supervisor of Speech and Hearing Therapy. Dr. Irwin will organize and supervise the state program in speech correction and lip reading. At present, standards are being set up for the training of teachers who can function in areas both of speech and hearing therapy.

The Speech Research Laboratory at the medical research facility, School of Aviation Medicine, NATB Pensacola, Florida, is headed by Lt. M. D. Steer, H(S) USNR. Some information about the type of research that has been done at this facility is now being released by the Navy. Early in the war a great deal of work was done on communication equipment. The present lip microphone was evolved here after prolonged experimental work with pilots. Inter and intracommunication in aircraft received intensive study. As a result of this research, speech training was incorporated in all primary and intermediate aviation training groups. The communication officers who give this instruction at the various air bases have all had a week's instruction at Pensacola.

Dr. Loretta Wagner Smith of Brooklyn College Speech Clinic reports 222 students registered in the clinic this fall. Of these, 146 are enrolled in the articulatory sections (of whom 82 have a defective [s], 52 are in voice classes, 18 are stutterers). There is one case of muscular dystrophy, two cases of spastic paralysis, and three hard-of-hearing cases.

Other clinic staff members at Brooklyn College include Dr. Melba Hurd Duncan, Dr. Arthur Secord, Miss Mildred Gottdank, Dr. Gladys Reid (a Brooklyn College graduate who received her Ph.D. degree last June at the University of Wisconsin) and Miss Georgiana Peacher (a candidate for the doctorate at Northwestern University).

The following communication from the Bell Telephone Laboratories has been received by the Editorial Office:

These Laboratories will demonstrate, on November 8, a method for making speech visible in changing patterns which are readable to the eye. Specifically, a man who has been deaf from birth will read speech sounds by seeing them displayed on a screen. In the same manner a number of girls with normal hearing who have been specially trained in interpreting the visible speech will carry on telephone conservations. The development now to be revealed holds promise of providing a substitute for hearing, and of greatly improving the speech of the deaf, of whom there are 100,000 in this country.

Information may be obtained from Bell Telephone Laboratories, 463 West Street, New York 14, N. Y.

(Continued on Page 328)

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Infant Speech Sounds and Intelligence

Orvis C. Irwin and Han Piao Chen*

THE PROBLEM considered in this article is the determination of the degree of relationship which exists between each of two series of Chen differential speech development scores and mental test scores of infants secured by the Kuhlman Test of Mental Development.

In a study on the speech sounds of newborn infants, Chen (**1**) formulated a number of indices and ratios which may be used for the purpose of studying pre-meaningful speech development. Chen has also formulated a differential speech development index which is described and used in this article. It is based upon the difference between speech sounds considered as isolated elements at a given infant age level and the status of these elements in adult speech. The adult speech sound standard with which infant speech was compared was one determined by Voelker (2).

THE CHEN index utilized in this paper is expressed in two forms. The first is the differential number index which is simply the difference between the number of vowels and consonants in infant and adult speech. In Voelker's sample of adult speech thirty-five elements were found. If a given child uses ten vowels and consonants then his differential number index is twenty-five. The older the child the smaller the difference will be. The second form is the differential percentage index which is based on the difference in the percentage of frequencies in the use of vowels and consonants of infants and adults. The total number of occurrences of the speech elements is taken as 100 per cent. Then the frequency of each phoneme is a certain percentage of the total. The derivation of this index is hypothetically illustrated below.

Phoneme	*1*	*2*	*Others*	*Total*
Adult Standard	5%	8%	87%	100%
Age-level Compared	20%	45%	35%	100%
Deviation	15	37	52	104

The sum of the deviations equals 104. Obviously as the child attains adult speech status the sum of the deviations will approach zero. The younger the infant the larger will be the sum of the deviations.

Speech records were selected in the following manner. For each infant for whom Kuhlman mental test scores were available two speech sound samples were selected from the total number of samples in the quarter-year of life in which the mental test had been given. If for that quarter-year three or more speech records were available on an infant the two nearest the date on which the Kuhlman had been given were chosen. The vowel and consonant frequencies of the two samples were pooled and the percentage frequency of each phoneme determined. Next the percentage frequency deviation of each phoneme from that of the adult was determined. These values then were correlated with mental test scores.

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TABLE 1. Number and percentage deviations from Voelker's standards for adults of phonemes used by infants.

1–6 Months					*7–12 Months*				
Child's number	Deviation No.	%	MA	IQ	Child's number	Deviation No.	%	MA	IQ
1	23	159	5	83	2	18	135	8	89
3	24	156	6	107	3	13	91	8	91
4	19	135	2	125	4	18	135	11	125
6	30	169	1	100	5	26	160	6	100
9	25	154	2	150	6	14	125	13	108
13	21	134	2	67	7	27	170	7	116
14	25	156	5	100	8	18	140	10	106
17	24	157	4	117	10	19	123	9	100
21	25	156	3	100	11	26	165	7	108
23	20	140	7	108	12	10	115	11	106
24	21	138	5	109	13	12	134	7	95
25	24	152	3	100	15	20	140	9	106
26	26	168	3	100	16	20	133	7	95
27	29	168	3	83	18	16	121	6	100
28	23	150	2	92	19	14	124	12	123
29	18	137	5	104	20	21	141	10	111
31	23	144	3	134	22	19	132	11	96
32	24	141	2	67	24	15	120	9	100
33	25	150	2	127	30	20	134	6	95
					31	12	118	11	101
					32	21	149	8	89
					33	22	143	7	113

13–18 Months					*19–24 Months*				
Child's number	Deviation No.	%	MA	IQ	Child's number	Deviation No.	%	MA	IQ
2	16	123	15	100	2	8	105	19	95
3	20	129	11	95	3	4	92	21	107
4	11	106	15	99	4	8	92	22	104
6	11	104	16	113	13	13	102	22	105
7	19	130	13	108	14	12	91	20	93
10	13	104	16	114	17	15	100	21	101
13	12	98	17	112	24	14	114	19	108
14	14	106	17	93	29	6	81	21	109
15	13	106	18	109	31	5	71	25	117
17	13	111	15	100	34	15	110	18	83
18	14	107	16	80	38	5	72	20	106
20	22	132	17	113	39	7	78	21	91
24	17	122	19	112	40	7	91	20	88
25	10	101	17	110	41	9	81	25	103
29	11	99	12	100	42	14	111	25	102
30	15	137	16	107	44	14	98	23	97
32	16	122	16	107	45	17	122	20	81
33	9	107	16	102	46	8	92	26	106
34	15	124	14	113					
35	11	114	16	103					
36	12	106	18	120					
37	22	139	16	107					
38	13	117	15	97					
39	22	138	13	105					
40	4	95	16	112					
41	20	131	17	109					
42	18	120	16	108					
43	13	92	18	117					
45	20	138	17	84					
46	12	96	18	101					
47	20	139	13	93					
48	18	125	18	111					

TABLE 2. Correlations between mental age (M. A.) and differential number indices (D.N.I.), and between M.A. and differential percentage indices (D.P.I.) for each of the four half-year periods of infancy.

Period	*r M.A.-D.N.I.*	*r M.A.-D.P.I.*
1– 6 months	.404 ± .13	.137 ± .15
7–12 months	.562 ± .10	.353 ± .13
13–18 months	.199 ± .12	.326 ± .11
19–24 months	.177 ± .15	.325 ± .14

TABLE 3. Correlations between intelligence quotient (I.Q.) and differential number indices (D.N.I.), and between I.Q. and differential percentage indices (D.P.I.), for each of the four half-year periods of infancy.

Period	*r I.Q.-D.N.I.*	*r I.Q.-D.P.I.*
1– 6 months	.056 ± .15	.015 ± .16
7–12 months	−.104 ± .14	−.250 ± .14
13–18 months	.126 ± .10	.198 ± .12
19–24 months	.463 ± .13	.421 ± .13

Product-moment correlations were run between mental age and each of the two Chen indices, also between IQ and these indices.

The infants used were twenty-four months of age and under. For purposes of analysis they were divided into four groups of half-year periods. The number of subjects in each group is as follows:

1- 6 months	19
7-12 months	22
13-18 months	32
19-24 months	18

Table 1 presents the relevant data from which the correlations were determined.

Table 2 presents two sets of correlations. The first set gives the correlations between mental age and the differential number indices for each of the four half-year periods of infancy. The second set shows the relationship between mental age and differential percentage indices. The tabulation is read: for the 1-6 month period the *r* for mental age with the differential number indices is .404±.13; for mental age with the differential percentage indices it is .137±.15.

This tabulation is read in the same manner as the previous one. Also, the same type of analysis used with the preceding set of *r*'s applies here. One of these *r*'s equals .46 and while it is not four times its probable error it does fall at the 5 per cent level of significance. However, it is the only one which attains even this degree of statistical confidence. Moreover, its coefficient of alienation is 88, indicating a high degree of absence of relationship. A third matter, closely connected with the predictive value of this set of *r*'s, concerns their real pertinence to the problem. It is doubtful for the solution of the problem in hand that an array of IQ values in which the chronological factor is taken out of the array is as helpful or as meaningful as an array of mental age values would be.

From an examination of these correlations it appears to be a reasonable generalization that there is a moderate degree of positive relationship between mental age and the two indices of speech sound development. The values for the first year in the first column and the last three *r*'s in the second column support this view. However, two matters are pertinent to a sound understanding of the problem. One concerns the statistical dependability of the coefficients, the other their predictive efficiency.

For the second half year the obtained coefficient between mental age and number differential is .56. This is statistically significant at the 1% level of confidence (five times its probable error). The value of .40, the next highest value, is less than four times its probable error. The remaining values in this column are not dependably positive, nor are those of the second column. In the total group, then, only one value is clearly significant in the sense of statistical reliability.

In regard to the matter of the degree of relatedness it should be pointed out that the coefficient of alienation for a correlation value of .56 is 84. This coefficient indicates the degree of *unrelatedness* of two variables. Moreover the index of forecasting efficiency of a value of .56 is 17. This means that its predictive efficiency is only 17 per cent better than a guess. Since all this applies to the highest r in the two columns the remaining ones need not be considered. Thus it is evident that the relationship between mental age and the two indices of speech development is too low for predictive use.

In order to see if the IQ's of these infants are at all related to the two indices the relevant correlations are given in Table 3.

THE foregoing analysis suggests that speech sound development for the first two years of life is independent of intelligence test scores. In view of the fact that extant tests of infant mental development include very few verbal items and totally neglect sound vocalization by infants, it would appear that Chen's differential method of scoring the elements of pre-meaningful infant speech may be considered another useful index in estimating the general development of infants.

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EDUCATION FOR MEASUREMENT

No one wishes to deny the possibility of measuring those highly important things in education and life that have so far remained unmeasurable, and some progress has been made in testing what have hitherto been regarded as intangibles. Nevertheless, there is always the risk with mechanistic measurement devices that they perpetuate the type of schoolwork easily measurable, with consequent neglect of the newer and more significant kind of education—the kind of education on which, in particular, the school's contribution to mental health so definitely depends.

W. CARSON RYAN, *Mental Health Through Education* (The Commonwealth Fund, 1938)

JOURNAL OF SPEECH DISORDERS, 1945, **10**, 297-302

Subjective Observations On Cerebral Palsy

Clyde C. Berger*

INSPIRATION for this paper stems from the fact that since birth the author has been severely handicapped by cerebral palsy. The subjective observations recorded here are drawn from his experiences during some six years of intensive and fruitful rehabilitative training at the Institute of Logopedics at the University of Wichita. During these fruitful years he has had the opportunity to follow an extensive course of scientific study with an eye to entering the field of logopedics as a research worker. This course of study has given him, as a by-product, an objective outlook on his handicap which has been a large factor in the success of his training program and which will contribute greatly to his future happiness and usefulness in life.

When, at the beginning of his graduate studies, the author was afforded the opportunity to study the problem of aphasia in detail, he was struck by the similarity between the symptoms of this disorder and those of his own handicap. The points of similarity were driven home by Goldstein's observations which will be discussed later.

The real objective of this paper is an attempt to give those who are engaged in training and education of cerebral palsied individuals some bits of information which may be of some value. No matter how well a teacher and his cerebral palsied pupil appear to understand and cooperate with one another, a gap exists between them. They have so little common ground to stand on. The teacher has never had cerebral palsy, and the pupil has never felt the sensations that go with being normal. Therefore, no matter how hard they try, it is difficult for them to come to a common understanding of their goal.

It is to be remembered in evaluating any subjective analysis of cerebral palsy that the narrator has little basis on which to compare himself to the normal, because the sensations he observes in his own body as he attempts to walk, talk and feed himself are normal to him, even though they may deviate greatly from the physiological norm. As a result he may overlook pieces of information that would be useful to his teachers and include extraneous material.

A COMPARISON of aphasia and cerebral palsy may contribute to a fuller understanding, and the first point of interest in this connection is to be seen in the etiologies of these two disorders. Both are caused by injury to the tissues of the brain. In either disorder the trauma may come about through birth injury, anoxia due to any cause, accident in adult life, lesions caused by syphilis or encephalitis, or disturbance of the blood supply to the brain by sclerosis or thrombosis, and lesions arising from tumorous growths in the brain substances.

Aphasia results from lesions in the cortex of the brain; the form the dis-

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order takes is dependent on the site of the lesion. Defects in Broca's area, located in the third frontal convolution, cause disorders in articulation and in the formulation of language. Lesions in the temporal and parietal areas give rise to receptive defects such as word deafness and difficulty in naming objects. Occipital lesions cause disturbances in the visual processes, and those in the frontal lobe bring about changes in personality.

In cerebral palsy the causative lesions are found lower in the brain. Lesions in the premotor area, designated as 'area 6' by Brodman, or in the internal capsule, cause true spasticity (**1**). Injury to the basal ganglia produces athetosis, and involvement of the cerebellum results in cerebellar ataxia. (**6**).

Lesions causing aphasia and cerebral palsy are seldom, if ever, confined to a single locus in the brain. For example, close examination of a supposedly pure case of Broca's aphasia, which, according to the classical definition, affects only the motor mechanism of speech, will reveal defects in perception and understanding of sensory stimuli. As a parallel it is to be noted that spasticity, athetosis and cerebral ataxia may appear in combination in a single case (**6**). The facts demonstrate the delicacy and complex organization of the brain.

Goldstein sums up the symptoms which express disintegration of the central nervous system as follows:

1. Damage to the nervous system causes an elevation of the threshold of stimulation and a retardation of excitation.
2. When it occurs, excitation spreads abnormally and continues for an extraordinarily long time.
3. The organism is hypersensitive to its environment.
4. Modification of performance is brought about through blurring of the figure-ground relationship. As a result parts of a situation are perceived instead of the whole, and maximal reactions tend to replace minimal (**3**).

Goldstein also mentions symptoms which do not stem directly from the specific injury but grow out of the attempt of the organism to face its environment with an altered nervous system. In extreme cases the human organism finds itself totally unable to meet all of the demands of life with this altered equipment, and so escapes the situation through the medium of unconsciousness, as seen in the epileptic. Cases of a less severe type react to situations with which they cannot deal by going to pieces mentally and physically. Thus the aphasic who is put to a task beyond his capacities exhibits gross changes in his physical and emotional state. His pulse and respiration become irregular, and his mood changes from one of good humor to one of sullenness, evasiveness, temper, or even aggressiveness. He is now seen in what Goldstein terms a catastrophic situation.

IN comparing cerebral palsy with aphasia, it is important to bear in mind that these two disorders may also appear together in the same case. Such cases call for special handling. They are severely handicapped in their rehabilitative programs by disturbed sensory intake and are sluggish in their reactions.

It must also be observed before putting the cerebral palsied individual against the background of Goldstein's observations that the author is primarily interested in aphasic disorders. He deals mainly with war injuries.

A comparison of the neurological aspects of cerebral palsy and aphasia may best be made under the headings Goldstein employs in the analysis of his cases.

RAISED THRESHOLD OF STIMULATION AND DELAYED ACTION

THE AUTHOR has had opportunity to observe these phenomena in childhood aphasia. They have come to his attention in the reactions and and speech responses of a four-year-old girl. At times this child stands about and stares vacantly into space.

She seems totally unaware of her environment and can be best described as being 'altogether out of this world.' Often she can be freed from this apathy by petting or spanking. If this condition is present at meal time, she will eat independently only after being fed a few spoonfuls of food. She displays many times a delayed speech response when asked if she wants a drink. She seems to ignore the question for a period of minutes and then responds with 'Linda want a dink.'

Another case (8), which the author has observed personally, a twenty-two-year-old man with severe expressive-receptive aphasia dating from birth, was given Head's Hand, Ear, and Eye Test (7). Although he responded correctly to most of the test commands, there was a marked delay in all of his responses. During the period of delay, he seemed to be expending a great deal of mental effort in comprehending the command.[1]

In marked contrast to the aphasic, the cerebral palsied individual shows a lowered threshold of stimulation. An unexpected loud noise causes the normal person to jump. Such stimulation sets off a whole battery of motor responses in the cerebral palsied individual. The hands clench tightly, the eyes blink so violently that one has to exert conscious effort to keep them open when noise is expected, and there are changes in respiration and a feeling of discomfort.

In cerebral palsy, as in aphasia, there is an exaggerated delay of effective response. However, this symptom manifests itself in very different ways in the two conditions. In aphasia there is an apparent lack of overt activity during the period of delay. It seems to require time for the uninjured parts of the brain to organize themselves to function without the damaged portion. The analogous delay in cerebral palsy is marked by much random muscular activity. When called on to recite in class, the cerebral palsied student finds his hands and feet going through all sorts of contortions. His eyes wander in every direction other than toward the person he is trying to address. This functional division among the members of his body causes considerable delay in his effective responses.

Abnormal Spread and Duration of Excitation

IN the normal nervous system excitation produces many responses in addition to the biologically adequate one. These responses give biological support to the effective one. In the injured nervous system these auxiliary responses increase in number and amplitude and often hinder the effective response instead of support it. Therefore, when excitation does occur in the aphasic or the cerebral palsied individual, it fails to confine itself to the production of just one specific result, as is the normal case. It also holds sway over the nervous system for a noticeably long period of time.

This abnormal spread and duration is particularly noticeable in the retraining of the cerebral palsied. If an emotional bit of conversation or a strange person is injected into the retraining situation, the performance of the case immediately changes for the worse. The author has noticed that even after having had considerable training in relaxation, he can still feel the excessive tension come into his muscles at the moment a stimulus presents itself. He can also feel this excessive tension decreasing at the instant the stimulus subsides.

In the human organism with an injured nervous system the lowered threshold of stimulation and the aberrant spread and duration of excitation creates a hypersensitivity to environment. The aphasic is thrown into disorganized reactions by changes in his environment so slight that they go unnoticed by the observer. On the other

[1]From a personal conversation with Mary Ellen Hull, Instructor, Institute of Logopedics.

hand, factors in the environment may work together to enable the supposedly speechless aphasic to give a speech response in a certain situation—the case who suddenly says 'Good-morning' when the doctor walks into his room. The author's statement above regarding alterations in performance testifies to similar environmental influence on individuals with cerebral palsy. Environmental pressure and emotion are major factors in determining the quality of motor performance in these cases. There are recorded cases in which persons with cerebral palsy, like aphasics, have suddenly accomplished feats hitherto beyond their capacities (**2**, **5**).

DISTURBANCE OF FIGURE-GROUND RELATIONSHIP

INJURY to the nervous system robs the human body of one of its distinctive properties: its capacity for specific action. Man no longer earns his daily bread simply by brute strength, but more through the delicate manipulation of his fingers. He communicates with his fellows by means of sounds produced by particular gross and fine movements in the different parts of his speech mechanism. When injury reduces this capacity for specific action, all parts of the body tend to function at once. In attempting the fine movements of writing, the cerebral palsied individual finds that his feet, his free hand and other parts of his body go through random movements. Most speech attempts throw his whole body into a grotesque pattern of accessory movements.

This phenomenon of mass action in cerebral palsy is comparable to what Goldstein (**3**) observes in his war-injured cases and describes as a disturbed figure-ground relationship. The meaning of this term may be illustrated by reference to the experience of looking at a picture. A single object in a picture carries a minimum of meaning without consideration of the background against which it stands. Similarly, in written and spoken language a single word carries little significance without its context. And in bodily mechanics the efficiency of movement of one part of the body depends on the relationship between the moving part and the other portions of the body.

Since in aphasia the lesion is in the associational and sensory areas of the brain, this disturbance of figure-ground relationship makes itself apparent in conceptual and receptive processes. The case is unable to relate detail to the whole of his environment in an effective manner. He may be able to comprehend the meaning of a whole sentence and yet be unable to recognize the component words, or vice versa.

The catastrophic situation in aphasia has been mentioned. It has a parallel in cerebral palsy. Here, however, the symptoms are predominantly in the motor field. As we have noted, the cerebral palsied individual in general experience has maximum voluntary control in orderly and familiar situations and exhibits aggravated symptoms when a disturbing factor enters his environment.

A short time ago the author found himself in the midst of a catastrophic situation at a party. During the first part of the evening which was spent at his place of employment, he noticed little excessive tension. He was able to sit relaxed and listen to the conversation. As usual he noted an increase in tension when he attempted to speak, but subjectively this did not seem excessive. He ate ice cream and cake without more than the ordinary difficulty and concern about spilling.

In the middle of the evening the party adjourned to the home of the host, the author's employer. Here the author had every intention of sitting by and watching the card games. First, however, he and a colleague went to the basement to inspect some guns. Upon their return to the group, the

hostess called the author to her and requested that he play her hand.

As soon as the author entered this new situation, the quality of his motor performance altered. He felt a tightness in his throat. His speech blocked as it had before his training began. He felt uncomfortably warm and drooling appeared. At the end of the evening he felt very fatigued. Several times during the evening he declined ice water because he felt certain that he could not handle the glass successfully. When given a drink in the kitchen he could hardly pick up the glass. As a precaution, he had the glass filled after putting both hands around it. Thus he avoided the risky venture of approaching a full glass with uncontrollable hands.[2]

ENVIRONMENTAL pressures giving rise to catastrophic situations in cerebral palsy need not be so great as those operating in the author's above-mentioned social adventure. Although he can tie a necktie, the author encounters extreme difficulty each morning in getting his bottle of hair oil down from the bathroom shelf. Subjectively this reaction seems to be set off by concern over knocking something off the shelf and waking the sleeping household. As an added example, the author can lift an empty glass to his lips in an almost normal manner, but when the glass is filled with water, he usually spills much of its contents as he tries to put his hands on the glass.

The catastrophic situation as related to cerebral palsy is difficult to define. At best its definition can be only relative. The author thinks of it as any situation which brings out the worst motor performance or most excessive over-performance in the case.[3]

[2]Although his associates have observed these reactions in the author in similar situations, this is the first attempt at subjective analysis. He is just becoming sharply conscious of his deviations in performance.

[3]The term 'catastrophic situation' has been adapted from Goldstein (see reference 3).

The author has noticed that the following factors influence his training-room performance adversely: unexpected visitors (expected visitors are not so disturbing), compliments from the teacher before an item of drill is completed, conversation on unusually interesting or emotional subjects, and persons who appear to be nervous or in a hurry.

Before leaving the consideration of the catastrophic situation in cerebral palsy, the author wishes to emphasize that he does not feel that such should be overzealously avoided. On the contrary, his own experiences and those of a cerebral palsied colleague show that these situations have positive as well as negative influences. Another experience of the author will illustrate this point.

Recently a large group of student nurses visited the laboratory. The size of the group made it impractical to show them through the training rooms and cases were therefore demonstrated before the entire group in the waiting room. Thus all cases demonstrated were subjected to a new environment, and the situation was ideal for producing catastrophic reactions.

When the author walked into the room to be demonstrated, there was such an excessive tension in his leg muscles that it took considerable effort to move them. As he walked across the room, he felt the tension diminish. After a few steps, he was walking with a fairly smooth gait and with no muscular discomfort. During the demonstration he was able to talk with his supervisor and to make a few remarks about his job to the whole group.

The fact that he was able to achieve a fair quality of motor performance and relaxation under the high environmental pressure of this situation leads the author to wonder if the catastrophic situation could not be employed as a training technique. How the body works at such a time depends upon

how the brain operates upon the tremendous flow of stimuli that impinge upon it from the external environment. The injured brain is hampered in segregating the useful from the useless stimuli; hence, the body tends to respond to all of them and so bungles any effective action attempted. The fact that there is some positive adjustment in catastrophic situations seems to show that perhaps such an overload forces the brain to reorganize itself to handle this tremendous overflow. This seems possible because modern studies indicate that the brain is an organ and that this organ is capable of compensating for an injury. The problem is to speed up this process of organization and push it further toward completion. In light of the facts, it seems that manipulation of the catastrophic situation might aid this process at certain stages. Much experimentation must be done in order to determine the practical worth of this suggestion. However, there would be grave danger of deadlock unless the case could thoroughly understand what was being done. Its use would most likely be limited to those cases who had achieved an objective point of view toward their handicap. Even so, other cases might benefit psychologically, and thus achieve a more objective attitude, from a thorough understanding of what makes them 'blow up.'

Research projects on both the problem of aphasia and that of cerebral palsy present themselves on every hand. Here are a few that suggest themselves to the author as being advantageous in the study of cerebral palsy:

1. The introduction of situational work into the training program as soon as any degree of muscular control is obtained and usable speech is developed.
2. The subjecting of experimental cases to catastrophic situations repeatedly to ascertain what adjustment might be made, and whether this adjustment would carry over to other situations.
3. Experimentation designed to indicate types of the best environment for training.

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JOURNAL OF SPEECH DISORDERS, 1945, **10**, 303-319

Control of Athetotic Tremors By Sound Stimuli

Martin F. Palmer*
Louis E. Zerbe

THERE are apparently few references in the literature to the objective study of the use or effects of music in relation to cerebral palsy, and the available references are difficult to review because as a rule the authors have not reported specific symptomatology. Moreover, references are usually to 'spastics,' and are therefore either limited in scope or ambiguous.

In 1937, Lord (**10**, 13-14) stated: 'Massage or rhythmic exercises done to favorite tunes are usually considered pleasurable and relaxing. . . . If the rhythm is sufficiently slow so that the child is not under the strain of "keeping up" to the time, the rigid limbs relax and the athetoid motions noticeably decrease. As the child's whole body swings into rhythm, the bells, clappers, or cymbals selected according to the capacity of the child sound more and more accurately in time and give convincing evidence of increased efficiency of motion.' It is not clear whether or not Lord meant that the children were attempting to play musical instruments. Donaldson (**5**, 8) claimed that 'spastics' were usually monotones but could make improvement.

The possible uses of music in treating cerebral palsy are illustrated by Carlson's (**2**, 324) case of a spastic girl who was so muscle conscious during meals that she could not feed herself, but nevertheless was able to forget herself at music to the extent that she played the piano most satisfactorily. Also Myers (**11**), in 1938, advised muting rhythmic musical instruments so as to render them less distracting or shocking to the already over-stimulated brain. 'Often in the enthusiasm and interest in playing an instrument with a group of others, you will find a child able to use both hands quite readily and his exultation when he finds he can is great' (**11**, 84). It will be noted that this statement by Myers concerning the muting of instruments is not confirmed in the present experimental series.

In 1934, Carlson (**3**, 3) advised having the patient concentrate on something else besides the exercises and stated: 'Slow, rhythmic music will obviate this difficulty, or anything which will tend to reduce the sensorial input to a minimum will be helpful.' Later (1939), he said: 'Rhythmic movements of the limbs accompanied by soothing music, heat . . . are among the factors that are conducive to relaxation' (**4**, 7).

The remainder of the literature concerned with music and cerebral palsy is similar in scope and description.

The following pertinent statement by Altshuler (**1**, 792) is in order: 'It is amazing that with such a large body of information and observation regarding the various properties of music, little has been translated into practice. One would expect that a medium which affects emotion, the endocrines, the circulation, the respiration, the blood pressure, the mood, association and imagery, would be worthy of further investigation.' According to Altshuler (**1**, 793), mental patients difficult to reach through the spoken word are still accessible rhythmically and tonally via the thalamus. Musical sounds apparently make themselves known on the cortex through the thalamus. A logical supposition follows that musical training would have definite effects on all malfunctions caused by brain lesions because of this tendency to produce cortical function and voluntary movements in time with the music.

Turning to athetosis itself, the literature is surprisingly scanty from the standpoint of objective study. Herz (**6**, 320) gives a good discussion of the symptomatology and his excellent description applies in some part to the subject studied in the present experiment.

Klingman and Carlson (**9**, 212-216) have published some kymographic tracings in

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athetosis.[1] Actually there appears to be no long-time consecutive study of athetotic tremors by means of the kymograph, and while detailed material cannot be presented in this article, this particular series of experiments represents the first long series of kymographic tracings in such a case.

According to Hoefer and Putnam (8, 11), the tremor in athetosis occurs as a result of irregular simultaneous motor unit discharges to antagonist muscles. Vermiform movement in athetosis is the result of this irregular discharge. The antagonists are in almost constant simultaneous innervation.

THE SUBJECT

THE SUBJECT was examined at the Institute of Logopedics of the Municipal University of Wichita in February, 1938. He had cerebral palsy, no intelligible speech, poor locomotion and, at the age of twenty-one years, was unable to dress himself.

The symptoms were a combination of spastic paralysis and tension athetosis. There were no overt vermiform movements. He was an honor graduate of high school and has since graduated from the University of Wichita. He now has intelligible speech, adequate locomotion, writes crude longhand and earns his own living.

In September, 1943, his right hand assumed suddenly some degree of relaxation. Upon disappearance of the tension athetosis, a true vermiform movement of the fingers of the right hand began, which was particularly marked in the index finger. The kymographic curves obtained by recording this movement changed constantly throughout the experiments, a finding which is in itself of interest. Most typically, the finger went into a slight extensor contraction, was held there temporarily, then moved downward, each joint moving in turn proximodistally until the finger was depressed with considerable force upon the tambour. There was then a slight pause, which was not a true pause but a more or less sinusoidal curve. In the tracings (see Figures, 1, 2 and 3), lateral movements as well as vertical movements are represented, since these could not be distinguished by means of the apparatus. Nevertheless all of the muscles involved acted in a similar fashion.

This phenomenon was called to the attention of Professor Zerbe, of the Department of Music, and it was agreed that a study should be made of the effect of musical tones and rhythms, primarily those of the violin, on this tremor. The findings made for the first time in these experiments are therefore to be considered joint findings.

PROCEDURE

THE SUBJECT was seated in a school desk chair where he could not see the recording styli or the experimenters. Into the inkwell hole of the desk a large tambour from the Lombard radial pulse apparatus was inserted. The subject's forearm was strapped to the desk to avoid involuntary movements of his arm. His finger was placed directly upon the tambour.

The finger movements were recorded on a Miller kymograph with the usual apparatus. A 1/5 second timer was used. The paper records ran about twelve minutes each, and it was possible to make two records each experimental day. The violin used in most of the experiments was an original Pressanda made in 1827 in Turin, Italy, and came from the Dykes collection in London. The room was sound-proofed, but some noise did come through the door. In all except one experimental day the only persons present were Professor Zerbe, Professor Palmer and the subject.[2]

For each experiment the authors prepared an outline in advance. When the outlined procedure had been completed, innovations were tried on the basis of the day's results. These improvisations are re-

[1]During the present series of experiments, the subject at one time or another demonstrated all of the curves illustrated in the article cited, plus many others.

[2]The subject was highly intelligent and not naive to experimental procedures. He quickly grasped the purpose of each experiment in spite of the utmost precautions. He could observe to some extent changes in the method of procedure. It may also be of some significance that he was extremely fond of music and reacted quite emotionally to music in general.

ported as part of the regular series of experiments.

The records were carefully analyzed by the usual techniques. The mass of detail, all of it important, was so great that the authors were forced to select only certain phases to report at this time. The records, complete analysis and all the data are on file at the Institute of Logopedics. A graph of the rate of the tremor was made for all experiments except 74, 98, 99, 110, 111, 112, 113, 119, 120, 121, and 125. These experiments could not be graphed. Most of the conclusions reached are based upon changes in rate and actual cessation of the tremor, rather than on the extent and vigor of the movements. The experiments which could not be graphed will be reported separately as the martele series.

FINDINGS

TWO very distinct groups of sound stimuli are represented in this series of experiments: (1) a more or less heterogeneous group and (2) a homogeneous group consisting of very sharp explosive isolated sound surges, which will be described later under the general title 'Martele Series.' It should be remembered that during the latter part of the series, the experiments comprising the martele series have been arbitrarily excluded for separate discussion, although actually they were part of the learning series of the experiment.

Tables 1 and 2 should be read as follows: *X* under *Experimental* means a stable vigorous pattern of tremor movement, *X* under *Control* means complete or nearly complete remission of tremor; *X?* under *Experimental* means a vigorous but somewhat irregular pattern of tremor movement, *X?* under *Control* means some reduction in rate of tremor; *O?* under *Experimental* means that the rate was not stable or vigorous but that there seemed to have been some effect upon it, *O?* under *Control* means a very slight reduction in rate which could not be considered mathematically certain; *O* under *Experimental* means that no effect could be observed, under *Control* it means that no reduction in rate occurred.

FULL descriptions of the stimuli used in this experimental series are as follows:

Scale G to G without vibrato. Sustained notes of approximately 15 seconds duration on the violin, low G to G one octave above (experiments 1, 3, 4 and 122).

Scale G to G with vibrato. Sustained notes on the violin of approximately 15 seconds duration with vibrato, low G to G above, vibrato on low G 'faked' (experiments 2, 5 and 123).

Scale C3 to C4 harmonics with and without vibrato. Sustained tones of approximately 15 seconds duration (experiments 6 and 7).

Open G on stlyus downbeat. Open G arco on downbeat of stylus mezzo forté, on extension phase of tremor (experiments 8, 16, 94, 96 and 108).

Open G on stylus upbeat. Open G arco on upbeat of stylus mezzo forté, on flexion phase of tremor (experiment 9).

Low A vibrato on stylus downbeat and upbeat. Same as for open G (experiments 10, 11 and 11a).

C3 and C4 with and without vibrato on stylus upbeat and downbeat. Similar to open G and open A stimuli (experiments 12, 13, 14, 15 and 15a).

Scale G to G and return to low G. Sustained notes without vibrato from low G to G above, then reversing the scale to low G again with approximately 10 seconds on each note of the upward scale and 15 seconds on each note of the downward scale (experiment 17).

Pizzicato chords on downbeat. Theme from Sevcik, Opus 2, Part 6, played in pizzicato on downbeat of stylus (experiments 18, 20, 22, 31, 41, 82 and 105).

Pizzicato single notes on downbeat. The notes used were the fundamentals from the Sevcik theme (experiments 19 and 32).

Spiccato à ricochet. The Sevcik theme played in spiccato à ricochet with a strong beat on the fundamental of each chord, each beat being on the downbeat of the stylus, four notes to each chord. In all such experiments the stylus indicated volume as well as tempo (experiments 21, 23, 24, 25, 26, 27, 30, 33, 34, 36, 38, 40, 42, 44, 67, 72, 75, 77, 86, 95, 97, 100 and 104).

'Rigaudon' in beat. 'Rigaudon' from 'Siciliano and Rigaudon' by Fritz Kreisler played allegro using the stylus as a tempo indicator (experiments 27, 29 and 35, experiment 43 at concert rate).

'Siciliano' not in beat. 'Siciliano' from 'Siciliano and Rigaudon' by Fritz Kreisler played at the usual concert rate without using the stylus as a tempo indicator (experiments 28 and 29).

'My Old Kentucky Home.' Arranged by Louis E. Zerbe in double, triple and quadruple stops for violin alone played at usual

concert rate without attention to stylus tempo (experiments 37, 39 and 45).

Tschaikowsky slow movement. 'Concerto for Violin and Orchestra,' by Tschaikowsky, slow movement, played at usual concert rate without attention to the stylus tempo (experiments 46, 48, 50, 52, 70, 71, 88 and 126, violin muted during experiment 71).

'Danse Tzigane.' 'Danse Tzigane' by Tividar Nachez, the friska or presto movement played at the usual concert rate without attention to stylus tempo (experiments 47 and 51).

Low G and high C orchestra bells. Repeated lowest and highest notes respectively on the orchestra bells, one note on each downward beat of the stylus (experiments 53 and 54).

Thirds, orchestra bells. Repeated thirds on the orchestra bells, middle C and E above, one chord on each downward beat of the stylus (experiments 55 and 56).

Arpeggios, orchestra bells. Simple harmonic triads in arpeggio formation throughout a simple harmonic progression with

TABLE 1. Specific experimental effect of each sound stimulus.

Day	*Run**	*Exp. No.*	*Stimulus*	*Experimental*	*Time in Seconds*	*Control*	*Time in Seconds*
1st	1st	1.	Scale G to G without vibrato	0	ca.120	0	ca. 120
1st	2nd	2.	Scale G to G with vibrato	0	ca.120	0	115.2
1st	2nd	3.	Scale G to G without vibrato	X?	99.6	0	39.6
2nd	1st	4.	Scale G to G without vibrato	0	113.8	0	62.8
2nd	1st	5.	Scale G to G with vibrato	0	106.0	0	28.2
2nd	2nd	6.	C3 to C4 harmonics without vibrato	0	119.5	X?	48.3
2nd	2nd	7.	C3 to C4 harmonics with vibrato	0	120.0	0	76.6
3rd	1st	8.	Open G on stylus downbeat	0	29.6	0	70.8
3rd	1st	9.	Open G on stylus upbeat	0	45.3	X	34.9
3rd	1st	10.	Low A vibrato on stylus downbeat (Curve pattern of tremor changes)	X?	62.2	0	27.8
3rd	1st	11.	Low A vibrato on stylus downbeat	0	28.6		
		11a.	followed by low A vibrato on upbeat		154.2		
3rd	2nd	12.	C4 on stylus downbeat	0	59.0	0	30.6
3rd	2nd	13.	C4 on stylus upbeat	0	32.4	0	27.4
3rd	2nd	14.	C3 vibrato on downbeat	0	31.2	0	30.4
3rd	2nd	15.	C3 vibrato on upbeat	0	31.8	0	24.2
3rd	2nd	15a.	C4 on downbeat	X	196.7		
4th	1st	16.	Open G on downbeat	X	60.0		
4th	1st	17.	Scale G to G and return to low G	0	228.9	0	66.2
4th	1st	18.	Pizzicato chords on downbeat	(1) X	18.0	X?	12.8
				(2) X	14.6	X?	22.4
4th	1st	19.	Pizzicato single notes on downbeat	X		X	
4th	2nd	20.	Pizzicato chords on downbeat	(1) X	21.6	0	20.4
				(2) X	21.4	0	21.4
				(3) X	22.4	0	21.2
4th	2nd	21.	Spiccato à ricochet	(1) X	26.4	0	20.0
				(2) X	34.4	X	19.5
				(3) X	27.2	X	19.4
4th	2nd	22.	Pizzicato chords on downbeat	(1) X	18.4	X?	24.6
				(2) X	18.6	X?	26.0
4th	2nd	23.	Spiccato à ricochet	(1) X	19.8	X	32.6
				(2) X	23.6	X?	21.6
				(3) X	20.0	X	ca. 7.0
5th	1st	24.	Spiccato à ricochet	(1) X	18.8	X	19.4
				(2) X	21.6	X?	30.0
				(3) X	21.0	X	23.2
				(4) X?	18.4	0	34.0
				(5) X	19.6	X	59.8
5th	1st	25.	Spiccato à ricochet	(1) X	19.0	X	26.0
				(2) X	16.2	X?	22.0
				(3) X	21.0	X	41.8
			(Subject coughed)	(4) X	26.0	0	22.2
			(Arm and shoulder tremor)	(5) X	22.6	0	ca. 20.0

TABLE I. *(Continued)*

Day	*Run**	*Exp. No.*	*Stimulus*	*Experimental*	*Time in Seconds*	*Control*	*Time in Seconds*
5th	2nd	26.	Spiccato à ricochet	(1) X	16.2	X?	18.8
				(2) X	17.0	X	19.8
5th	2nd	27.	Spiccato à ricochet and Rigaudon in beat	(1) X?	8.6		
				(2) X	38.2	X	32.2
				(3) X	18.6	X	13.2
5th	2nd	28.	Siciliano not in beat	(1) X	27.8	X	14.8
				(2) X	22.6	X	20.2
				(3) X?	30.0	X?	18.2
5th	2nd	29.	Rigaudon vs. Siciliano Rig.	(1) X	18.4	X	48.2
			Sic.	(2) X	20.4	X	39.6
			Rig.	(3) X	17.0	X?	32.4
6th	1st	30.	Spiccato à ricochet (Eblen assisting)†	(1) X?	21.0	0?	17.6
				(2) 0?	25.0	0	24.2
				(3) X	25.2	0?	27.6
6th	1st	31.	Pizzicato chords on downbeat (Eblen assisting)	(1) X?	26.8	X?	16.6
				(2) X	18.4	X?	20.6
				(3) X	17.8	X?	32.0
6th	1st	32.	Pizzicato single notes on downbeat (Eblen assisting)	X?	23.0	X?	41.0
6th	1st	33.	Spiccato à ricochet (Eblen assisting)	(1) 0?	58.2	X?	35.8
				(2) X?	22.4	X?	35.2
				(3) X	21.6	X	24.2
6th	2nd	34.	Spiccato à ricochet (Eblen assisting)	(1) X	22.2	X?	23.2
				(2) 0	23.6	0	18.8
6th	2nd	35.	Rigaudon on downbeat (Eblen assisting)	(1) X?	26.8	0	13.6
				(2) X?	36.6	0	35.8
				(3) X	36.2	0	18.6
6th	2nd	36.	Spiccato à ricochet (Eblen assisting)	X	19.2	X	19.8
6th	2nd	37.	My Old Kentucky Home (Eblen assisting)	X	43.8	0?	23.0
6th	2nd	38.	Spiccato à ricochet (Eblen assisting)	(1) X?	19.4	X?	23.8
				(2) X?	19.0	X?	25.4
6th	2nd	39.	My Old Kentucky Home (Eblen assisting)	(1) X?	18.0	X	20.2
				(2) X	17.0	X	17.4
				(3) X	5.4	X	13.6
7th	1st	40.	Spiccato à ricochet	X	19.0	0	27.2
7th	1st	41.	Spiccato and pizzicato chords	X	31.4	0?	38.8
7th	1st	42.	Spiccato a ricochet	X	25.6	0?	35.6
7th	1st	43.	Rigaudon not in beat	X	25.8	X?	33.6
7th	1st	44.	Spiccato à ricochet	X	19.8	X?	32.8
7th	1st	45.	My Old Kentucky Home	(1) X	20.6	X	24.4
				(2) X	11.0	X	16.6
				(3) X	10.4	X	16.2
				(4) X	7.6	X	13.8
				(5) X	11.0	X	22.6
				(6) X	4.4	X	19.4
				(7) X	3.6	0?	20.0
7th	2nd	46.	Tschaikowsky slow movement	X?	23.4	X	22.4
7th	2nd	47.	Danse Tzigane	X	17.6	X?	14.2
7th	2nd	48.	Tschaikowsky slow movement	X	23.0	X	39.8
7th	2nd	49.	My Country Tis of Thee	X	9.0	X	38.0
7th	2nd	50.	Tschaikowsky slow movement	(1) X	36.0	X	36.8
				(2) X	42.4	X	56.2
7th	2nd	51.	Danse Tzigane	X	31.4	X	13.2
7th	2nd	52.	Tschaikowsky slow movement	(1) X	10.6	X	46.6
				(2) X	40.8	X	17.2
8th	1st	53.	Low G orchestra bells	(1) X	18.0	X?	17.4
				(2) X	19.2	0?	22.6

TABLE I. *(Continued)*

Day	*Run**	*Exp. No.*	*Stimulus*	*Experimental*	*Time in Seconds*	*Control*	*Time in Seconds*
8th	1st	54.	High C orchestra bells	(1) X	20.8	0?	24.4
				(2) X	17.4	X	24.2
8th	1st	55.	Thirds orchestra bells	(1) X	22.2	X	37.6
				(2) X	20.6	X	21.2
8th	1st	56.	Thirds orchestra bells	(1) X	3.4	X	3.6
				(2) X	2.6	X	6.6
				(3) X	3.4	X	24.2
8th	1st	57.	Arpeggios orchestra bells	(1) X	22.8	X?	23.0
				(2) X	18.2	X	24.8
				(3) X	13.4	X	14.4
8th	1st	58.	Arpeggios orchestra bells	(1) X	2.2	X	10.2
				(2) X	2.0	X	13.4
				(3) X	5.8	X	10.4
				(4) X	5.0	X	5.0
8th	2nd	59.	Swanee River orchestra bells	(1) X	17.2	X?	23.2
				(2) X?	16.4	X?	40.4
				(3) X	17.6	X	28.4
8th	2nd	60.	Minor tune orchestra bells	X?	33.6	X?	68.4
8th	2nd	61.	Swanee River orchestra bells	(1) X	3.6	X	18.8
				(2) X	4.0	X	11.4
				(3) X	6.8	X	14.0
				(4) X	2.0	X	12.2
8th	2nd	62.	Cigar box on downbeat	X	17.2	X	17.2
8th	2nd	63.	Cigar box, various rhythms	X	25.8	X	18.6
8th	2nd	64.	Tapping various items	X?	37.4	0?	33.6
8th	2nd	65.	Clapping hands on downbeat	X	21.0	X	27.8
8th	2nd	66.	Alternate bell and cigar box	X	20.4	X	10.0
9th	1st	67.	Spiccato à ricochet	(1) X?	20.8	0?	23.6
				(2) X	18.4	0	23.2
				(3) X	18.6	0?	34.0
8th	1st	68.	Max Bruch Adagio	(1) X	30.0	0	24.8
				(2) X	30.0	X?	28.6
9th	1st	69.	Max Bruch Adagio	(1) X	99.0	X	22.2
				(2) X?	56.8	X?	43.2
9th	2nd	70.	Tschaikowsky slow movement	X	70.2	X?	14.6
9th	2nd	71.	Tschaikowsky slow movement muted	X?	70.4	X?	15.4
9th	2nd	72.	Spiccato à ricochet (muted)	(1) X	10.2	X?	10.4
				(2) X	1.0	X?	3.4
				(3) X	1.4	X	3.4
				(4) X	2.4	X	7.8
9th	2nd	73.	Rapid C scale	X	3.0	X	3.0
9th	2nd	74.	Martele series				
9th	2nd	75.	Russian Soldier's Song and spiccato a ricochet	X?	27.4, 6.4	X?	18.0
9th	2nd	76.	Russian Soldier's Song	X	43.8	X?	12.8
9th	2nd	77.	Spiccato à ricochet	(1) X	14.4	X?	15.0
				(2) X	19.8	X	23.0
9th	2nd	78.	Rondino—Kreisler	X	59.8	X?	14.8
10th	1st	79.	Octave glissandi in beat	0	78.4	0	17.4
10th	1st	80.	Octave glissandi not in beat	X?	36.6	X?	11.6
10th	1st	81.	Improvised non-legato tune in rhythm	0	35.0	0?	36.2
10th	1st	82.	Pizzicato chords in beat	(1) X	39.6	X	20.2
				(2) X	16.6	X	19.4
				(3) X	17.0	X	24.8
10th	1st	83.	Octave glissandi in beat	X	26.6	X?	17.8
10th	1st	84.	Octave glissandi not in beat	X	35.4	0?	20.6
10th	1st	85.	S.mple glissandic melody not in beat	X	23.0	X	24.4
10th	2nd	86.	Spiccato à ricochet	X?	41.8	0?	23.6
10th	2nd	87.	Tapping cigar box in beat	X	24.4	X?	33.4

TABLE 1. *(Continued)*

Day	*Run**	*Exp. No.*	*Stimulus*	*Experimental*	*Time in Seconds*	*Control*	*Time in Seconds*
10th	2nd	88.	Tschaikowsky slow movement	X	58.4	X?	24.6
10th	2nd	89.	Russian Soldier's Song	X	30.0	X?	27.2
10th	2nd	90.	Old Black Joe	X	41.4	X?	11.2
10th	2nd	91.	Cradle Song—Hauser	(1) X	40.2	X?	17.8
				(2) X	39.6	X	12.8
10th	2nd	92.	Traumerei—Schumann	(1) X	37.6	X	16.8
				(2) X	37.4	X?	12.6
10th	2nd	93.	Mazurka—Wieniawski	X	42.6	X?	9.4
11th	1st	94.	Open G on downbeat	(1) X?	23.8	X?	14.4
				(2) X	18.4	X?	23.8
				(3) X	15.0	X	26.4
11th	1st	95.	Spiccato a ricochet	(1) X	19.4	X?	17.2
				(2) X	19.2	X	19.4
11th	1st	96.	Open G on downbeat	(1) X	20.0	X?	19.6
				(2) X	17.6	X	24.4
				(3) X	19.6	X?	18.2
11th	1st	97.	Spiccato à ricochet	X	25.6	X	21.8
11th	1st	98.	Martele series				
11th	1st	99.	Martele series				
11th	2nd	100.	Spiccato à ricochet	(1) X	15.6	X	16.0
			(Subject cooperating)	(2) X	18.6	X	20.0
				(3) X	23.8	X	32.4
11th	2nd	101.	Russian Soldier's Song	(1) X	30.6	X?	16.8
			(Subject cooperating)	(2) X	19.4	X?	23.6
11th	2nd	102.	To a Wild Rose	(1) X?	18.0	0?	20.4
			(Subject cooperating)	(2) X	18.0	X	12.6
11th	2nd	103.	Russian Soldier's Song	X	14.2	0	15.2
			(Subject cooperating)				
11th	2nd	104.	Spiccato à ricochet	X	14.6	X	21.2
			(Subject cooperating				
11th	2nd	105.	Pizzicato chords in beat	(1) X	21.0	0	20.2
			(Subject cooperating)	(2) X	10.0	X	15.8
11th	2nd	106.	To a Wild Rose	X	16.2	X	19.6
			(Subject cooperating)				
11th	2nd	107.	Cradle Song—Hauser	(1) X?	15.6	X	26.0
			(Subject cooperating)	(2) X?	28.4	X?	13.2
12th	1st	108.	Open G on downbeat	(1) X?	19.0	X	24.2
				(2) X	21.6	X	34.0
				(3) X	20.0	X	50.2
12th	1st	109.	Martele scale on downbeat	(1) X	24.8	X	14.4
				(2) X	24.4	0?	21.0
12th	1st	110.	Martele series				
12th	1st	111.	Martele series				
12th	2nd	112.	Martele series				
12th	2nd	113.	Martele series				
12th	2nd	114.	Strongly accented tune	X?	19.4	X	9.2
12th	2nd	115.	Strongly accented tune and Cradle Song—Hauser	X	22.0, 30.6	X	15.8
12th	2nd	116.	Cradle Song—Hauser, and strongly accented tune on downbeat	X?	16.0		
			Strongly accented tune not in beat	X	15.2		
			Cradle Song—Hauser, and strongly accented tune	X	2.2, 2.2	X?	8.8
			Cradle Song—Hauser	X	14.4	X	2.0
			Glissandi in beat	X	6.2	X	3.2
			Arpeggios in beat	X	7.0	X	9.6
12th	2nd	117.	Slow piano minor improvisation	X	23.0	0?	15.8
13th	1st	118.	Slow piano major improvisation	X	88.0	X?	27.6

TABLE 1. *(Continued)*

Day	*Run**	*Exp. No.*	*Stimulus*	*Experimental*	*Time in Seconds*	*Control*	*Time in Seconds*
13th	1st	119.	Martele series				
13th	2nd	120	Martele series				
13th	2nd	121.	Martele series				
14th	1st	122.	Scale G to G without vibrato	X	117.0	X	60.4
14th	1st	123.	Scale G to G with vibrato	X	117.0	X	160.8
14th	1st	124.	Visual experiment	(1) 0?	37.0		
				(2) X	20.2		
14th	2nd	125.	Martele series				
14th	2nd	126.	Slow movement, Tschaikowsky	X	22.8	X	54.0
14th	2nd	127.	Confirmation-martele series				

*Two runs of the apparatus were made each experimental day. Except for Experiment 118, from one to two minutes of silence were allowed to elapse as an initial control period before any stimuli were given.

†On January 22, 1944, Mr. Roy E. Eblen, Jr., Director of the Winfield Unit of the Institute of Logopedics, assisted by palpating all of the muscles of the right arm during the experimental periods and controls in order to rule out the possibility that the subject might be assisting the effect of the experiments by going into a tension athetosis. The results of the extra sensory stimuli were that the experimental periods were more irregular in rate, and in the first part of the series of that particular day remissions from tremor were rare. In every control period, however, Mr. Eblen reported that the normally 'tense' muscles of the subject appeared to be perfectly relaxed.

TABLE 2. Effect of the various specific types of stimuli without regard to seriatim position.*

Stimulus	*Exp. X*	*Exp. O*	*Cont. X*	*Cont. O*
Scale G to G without vibrato	2	2	1	3
Scale G to B with vibrato	1	2	1	2
C3 to C4 harmonics without vibrato	—	1	1	—
C3 to C4 harmonics with vibrato	—	1	—	1
Open G on downbeat	10	1	9	1
Open G on upbeat	—	1	—	1
Low A vibrato on downbeat	1	—	—	1
Low A vibrato on downbeat and upbeat	—	1	—	1
C4 on downbeat	—	1	—	1
C4 on upbeat	—	1	—	1
C3 vibrato on downbeat	—	1	—	1
C3 vibrato on upbeat	—	1	—	1
Scale G to G and return to G	—	1	—	1
Pizzicato chords on downbeat	12	—	10	4
Pizzicato single notes on downbeat	2	—	2	—
Spiccato à ricochet	38	3	27	14
Spiccato à ricochet and Rigaudon	3	—	2	1
Siciliano not in beat	3	—	3	—
Rigaudon on downbeat	5	—	2	3
My Old Kentucky Home	8	—	6	2
Spiccato and pizzicato	1	—	—	1
Rigaudon, not in beat	1	—	1	—
Tschaikowsky slow movement	7	—	7	—
Danse Tzigane, not in beat	1	—	1	—
My Country Tis of Thee	1	—	1	—
Low G orchestra bells	2	—	1	1
High C orchestra bells	2	—	1	1
Thirds orchestra bells	5	—	5	—
Arpeggios orchestra bells	7	—	7	—
Swanee River orchestra bells	7	—	7	—
Minor tune orchestra bells	1	—	1	—

TABLE 2. *(Continued)*

Stimulus	*Exp. X*	*Exp. O*	*Cont. X*	*Cont. O*
Cigar box on downbeat	2	—	2	—
Cigar box, various rhythms	1	—	1	—
Tapping various items	1	—	—	1
Clapping hands on downbeat	1	—	1	—
Alternate bell and cigar box	1	—	1	—
Max Bruch Adagio	4	—	3	1
Tschaikowsky (muted)	1	—	1	—
C scale rapidly	1	—	1	—
Russian Soldier's Song	5	—	4	1
Rondino	1	—	1	—
Octave glissandi in beat	2	1	2	1
Octave glissandi not in beat	1	—	—	1
Simple glissandic melody	1	—	1	—
Old Black Joe	1	—	1	—
Cradle Song—Hauser	5	—	5	—
Traumerei—Schumann	2	—	2	—
Mazurka—Wieniawski	1	—	1	—
To a Wild Rose	3	—	2	1
Martele scale on downbeat	2	—	1	1
Strongly accented tune, downbeat	1	—	1	—
Strongly accented tune, downbeat and Cradle Song	1	—	1	—
Strongly accented tune, not on downbeat and Cradle Song	1	—	1	—
Arpeggios in beat	1	—	1	—
Minor pianissimo improvisation	1	—	—	1
Major pianissimo improvisation	1	—	1	—
Vision	1	1	—	—

*For simplicity in calculation, all X?'s in Table 1 were called X, all O?'s were called O. The fallacy probably does not vitiate the result.

four notes to each downward beat of the stylus (experiments 57 and 58.)

'Swanee River,' orchestra bells. Melody of 'Swanee River' by Stephen Foster played at usual concert rate, without attention to the stylus tempo (experiments 59 and 61).

Minor tune, orchestra bells. Free extemporization of a folk-like melody similar in tempo and length to 'Old Black Joe' by Stephen Foster (experiment 60).

Cigar box on downbeat. Bell hammer tapping lid of closed cigar box using the stylus as volume and tempo indicator, one tap per beat (experiments 62 and 87).

Cigar box, various rhythms. Bell hammer tapping lid of closed cigar box with two to four taps per stylus beat, chosen haphazardly (experiment 63).

Tapping various items. Tripod stand, table, cigar box, etc. tapped haphazardly, one tap per stylus beat (experiment 64).

Clapping hands on downbeat. Hands clapped very loudly, one clap per stylus downbeat (experiment 65).

Alternate bell and cigar box. Lowest G on the orchestra bells tapped alternately with lid of cigar box, one tap per stylus downbeat (experiment 66).

Max Bruch Adagio. Second movement, 'Adagio', from the 'Concerto in G Minor for Violin' by Max Bruch played at the usual concert rate without attention to the stylus tempo (experiments 68 and 69).

Rapid C scale. C scale on the violin, played legato and rapidly from low G upward (experiment 73).

Russian Soldier's Song. 'Russian Soldier's Song' by Dubensky using the beat of the stylus as tempo indicator (experiments 75, 76, 89, 101 and 103).

Kreisler Rondino. 'Rondino on a theme by Beethoven' by Kreisler played at the usual concert rate without attention to the stylus tempo (experiment 78).

Octave glissandi in beat and not in beat. Four ascending alternating glissandi with four descending glissandi on each string with the first finger. The order of strings was: D string, A string, E string, then G string; e.g., on the D string—E to E, then down to E again, F sharp to F sharp and down to F sharp again, etc. (experiments 79, 80, 83, 84 and 116).

Improvised non-legato tune in rhythm. A series of improvised tones related in a definite time scheme to the stylus tempo, one, two or three notes being played for each beat but with no legato or glissandi between notes (experiment 81).

Simple glissandic melody not in beat. Simple melodic improvisation with every note joined by a glissando to the next in an attempt to produce continuous sound. No attention was paid to stylus tempo (experiment 85).

'Old Black Joe.' Melody of 'Old Black Joe' by Stephen Foster played forté and largo without attention to the stylus tempo (experiment 90).

'Cradle Song.' The 'Cradle Song' by Hauser played at the usual concert rate without attention to the stylus (experiments 91, 107, 115 and 116).

'Traumerei.' 'Traumerei' by Schumann played at the usual concert rate without attention to stylus (experiment 92).

'Mazurka.' 'Obertass Mazurka' by Wieniawski played forté fortissimo at the usual concert rate without attention to the stylus tempo (experiment 93).

'To a Wild Rose.' 'To a Wild Rose' by Edward MacDowell played at the usual concert rate without attention to stylus tempo (experiments 102 and 106).

Martele scale on downbeat. Martele scale from low A to second A above and return, one note of the scale for each downbeat of the stylus (experiment 109).

Strongly accented tune. Improvised strongly accented tune in a major key played marcato, forté, allegro (experiments 114, 115 and 116—in tempo only in experiment 116).

Arpeggios in beat. Arpeggios on a major triadic progression with the stylus serving as tempo indicator (experiment 116).

Slow piano minor improvisation. Minor adagio improvisation played pianissimo without attention to stylus tempo (experiment 117).

Slow piano major improvisation. Before the subject was brought into the experimental room a major adagio improvisation was begun and played pianissimo throughout the experimental period, no attention being paid to stylus tempo (experiments 118 and 121).

Visual experiment. The operator suddenly rose and in full view of the subject deliberately manipulated the apparatus in an apparently meaningful but actually purposeless manner, then waved his arms, making a vigorous downward conducting movement for each downbeat of the stylus (experiment 124).

Martele series.

1. Part A, four isolated martele type major triads at about 3.0 seconds; Part B, the same on the downbeat of the stylus; Part C, eight chords as in Part A at intervals from 1.0 to 3.0 seconds (experiment 74).

2. Two octaves upward from low A to second A above with brief martele bow strokes played forté, and the same notes played downward. In both cases no note was played so long as the tremor was in remission; as soon as a free tremor movement occurred a group of notes was played at about one to two second intervals (experiments 98, 99, 110, 120 and 121).

3. Bowed chords played similarly to the martele technique from the theme by Sevcik, Opus 2, Part 6, again using the teaching techniques described above (experiments 111 and 112).

4. Shouting isolated 'da' (about 100 dvs.) sounds, using a tone pattern similar to the Sevcik theme (experiment 113).

5. Open G martele using the same general techniques (experiment 119).

The tabulation of the series shows that it was possible to obtain remissions of tremors in varied ways.

Disregarding the conditioning and learning effect it is possible to study the effect of the stimuli by grouping them as shown in Table 2.

FROM the complete analysis it would seem that pizzicato chords or single notes in harmonic progression, and in beat with the tremor would have been more effective than spiccato à ricochet. Since a detailed analysis was not made until the close of the series, the spiccato was used mainly because it was obviously effective. However, use of the pizzicato alone might have produced the same results.

Statistical evaluations of the kind here employed are to be considered with due reference to the possible effects of any learning or conditioning factors involved in the experiments. It is, however, possible to rank the general types of sound stimuli used, on the basis of the average of their effectiveness in the experimental periods, and in the control periods. The ranking in Table 3 on a basis of 1 to 10 gives some information.

Too much reliance should not be placed on the tabulation in Table 3 because of the data from the martele series. The validity of the ranking is also doubtful for the following reasons:

A. Each day there were approximately 16 experiments. The sound stimuli occurring early in the daily

TABLE 3. Comparative effect of general types of sound stimuli on the athetotic tremor.

Stimulus	*Rank*
1. Sound stimuli with intellectual and emotional components (e.g., composed music)	1.5
2. Sound stimuli of a rhythmic nature, not related to the tremor rhythm	2.0
3. Sound stimuli of a 'noise' character	2.0
4. Sound stimuli of a rhythmic nature, with the rhythm related definitely to the tremor rhythm	5.0
5. Sounds of a more or less continuant nature	5.0
6. Sounds having a surge character, with a definite accentual and isolated beat	5.5
7. Sound stimuli of a more or less arbitrary structure with probably little emotional and intellectual configuration	6.5
8. Sound stimuli of relatively low pitch	8.0
9. Sound stimuli of an arrhythmic nature	9.0
10. Sound stimuli of relatively high pitch	10.0

series would be expected to be less effective than those occurring later.

B. The same consideration is pertinent when the series as a whole is reviewed. The temporal distribution of the various types of sound stimuli with reference to the sequences of the experimental series was not systematically varied or controlled, and for this reason the ranking of the different stimuli as to their effectiveness may not be taken as of unquestioned validity.

C. Position in the experimental series is important in determining experimental success. The average number of experiments per run of the apparatus was approximately 8 (7.7). Table 4 indicates: (1) That rhythmic sound stimuli related to the tremor beat, sound stimuli without intellectual and emotional components, and sound stimuli of more or less continuant nature, all occurred on the average at least one experiment earlier than their converses. (2) That the experimental and control failures of these converses occurred on the average 1.42 experiments earlier than the successful experimental and control periods.

This internal evidence shows that sound stimuli with emotional and intellectual components, not related to the beat of the tremor, and of a con-

TABLE 4. A tabulation by seriatim and success.

Stimulus	*Ave. daily positional rank in series*	*Success X-X*	*Failure O-O*	*Exp. per. X*	*Exp. per. O*	*Cont. per. X*	*Cont. per. O*
Rhythmic related	4.19	4.98	2.93	4.31	3.13	4.93	3.64
Rhythmic not related	5.03	5.41	.....	5.09	.....	4.96	6.09
Arrhythmic	2.51	xxx*	xxx	xxx	xxx	xxx	xxx
Intellectual and emotional	4.93	5.35	.....	4.93	.....	4.95	4.46
Not intellectual and emotional	4.06	4.85	2.76	4.29	2.81	4.53	3.11
High pitch	2.92	xxx	xxx	xxx	xxx	xxx	xxx
Low pitch	3.00	xxx	xxx	xxx	xxx	xxx	xxx
Noise	6.13	xxx	xxx	xxx	xxx	xxx	xxx
Surge character	3.93	4.74	3.62	5.03	3.51	4.13	3.51
Continuant	4.53	5.16	2.25	4.71	2.52	4.98	3.49

*Too few cases for accurate analysis.

TABLE 5. A selection of certain types of stimuli occurring most frequently.

Stimulus	*Ave. daily positional rank in series*	*Success X-X*	*Failure O-O*	*Exp. per. X*	*Exp. per. O*	*Cont. per. X*	*Cont. per. O*
Open G on downbeat	2.69	2.87	1.00	2.79	1.00	2.97	1.00
Pizzicato chords on downbeat	4.11	4.88	.....	4.11	.....	4.88	2.58
Spiccato	4.00	4.36	1.70	3.99	4.20	4.36	3.22
Composed music related to tremor	4.75	5.97	.....	4.75	.....	5.97	2.93
Composed music not related to tremor	5.16	5.15	.....	5.29	.....	5.05	4.80

tinuate character are at least no more effective in increasing and remitting the tremor than the converses, and probably also shows merely that the experimental order was at fault. Further, it shows that successes and failures with all types of sound stimuli may occur anywhere throughout such a series of experiments. Table 5 gives similar evidence.

The first three groups in Table 5 occur approximately one experiment earlier in the series than the last two groups. The failures of the first three groups occur 1.65 experiments earlier than the successes. This is true also for the only failures that occurred in the last two groups, and is confirmed by the fact that the music with emotional and intellectual components also failed when placed early in any series. Thus this type of music probably has no greater effect than the non-intellectual type.

SO FAR as the subject of this experiment is concerned, the authors feel justified in the assumption, particularly when the martele series is reviewed, that sound stimuli of a rhythmic character related definitely to the athetotic tremor rhythm must be used to produce an increase in the vigor, rate and stability of the tremor and consequent remission of it during periods of silence immediately following the stimuli.

The distribution of the successes and failures of the experimental and control periods shows a learning effect. Control periods with little or no effect on the remission of the tremor occur as a mean at sequence 68, while control periods reducing or eliminating the tremor occur as a mean at sequence 111. There remissions from tremor are skewed even more towards the end of the series than successful experimental periods. It should be noted that failures in both the experimental periods and controls can occur at any time during such a series, but that they become less and less frequent. Successes

TABLE 6. Arbitrary ratings of success and failure for the first fourteen days.*

Day	*Experimental Period*	*Control Period*
1st	— 60	—100
2nd	—100	— 70
3rd	— 75	— 76
4th	84	5
5th	100	40
6th	51	12
7th	100	72
8th	100	86
9th	100	50
10th	90	68
11th	100	72
12th	100	74
13th	100	100
14th	77	100

*On any one day successful experimental periods were counted as plus two, questionably successful experimental periods were counted as plus 1, questionable failures of the experimental periods as minus 1, and experimental failures as minus 2. The addition was expanded into plus or minus 100 due to the difference in numbers of experiments on any one day. Days were from one week to six weeks apart.

in both the experimental periods and controls can occur early in the series (18th experiment) and become more and more frequent.

There was a significant difference found in regard to the proportionate amounts of success and failure when the results for single days were tabulated. This is illustrated in Table 6. On the fourth day of the series, the experimental period was classified for the first time as 'successful.' This was probably due in some part to the change in techniques, but it is also further evidence that remissions from tremor in the control period do not begin to occur until the tremor in the experimental periods has been increased in rate, severity and stability.

SUMMARY OF FINDINGS

A STUDY of the experimental and control periods shows that the remissions from tremor were causally related to the techniques used. A study of the *successful* experimental periods and controls demonstrates further that in order to obtain remissions from athetotic tremors at will by means of sound stimuli, it is necessary to be able to produce an increase in the severity, vigor, stability and rate of the tremor during the sound stimuli and follow it immediately with a period of silence.

Other observations made during this study which appear to be significant are as follows:

1. Sound stimuli of the patterns used in this experiment tended to produce a tremor of almost predictable rate.

2. Any sound stimuli (or visual stimuli) in any pattern usually had a stabilizing effect on the tremor rate.

3. Control periods (periods of silence) were usually less stable in rate than experimental periods.

4. Control periods on experimental days prior to any experimental periods were more irregular in rate than subsequent control periods.

5. Sudden onsets of sound stimuli after periods of silence usually produced gains in the tremor rate. When the sound stimuli did not produce this gain in rate, the tremor rate in the preceding control period had been above the lower rate predicted as 84 per minute minus 21.6.

6. Cessation of sound stimuli at the close of experimental periods was usually followed by a decrease in tremor rate.

7. The onset of sound stimuli at the beginning of experimental periods, and the cessation of sound stimuli at the beginning of control periods in every instance produced changes in the tremor rate.

8. An effect tentatively called an 'innovation effect' was sometimes noticed in these experiments. The result of introducing new material, or abruptly changing the experimental or control conditions in some cases, was to decrease the tremor rate. This effect was not predictable. Apparently it depended upon the endogenous psychophysical organization of the subject at the time of the innovation. Or perhaps what was considered by the authors to be an innovation was not actually received as such by the subject, or vice versa.

9. In this series, timing the rhythm of the sound stimuli to the extensor portion of the tremor produced better results than timing it to the flexor portion.

DURING the tenth and eighteenth experiments, the character of the curve pattern changed suddenly and continued to change throughout the series. Prior to the tenth experiment, the curve was irregular in extent, duration and length of time on any phase. At the tenth experiment there was a definite change to a curve more stable in rate, with the greatest amount of time spent on the phases of greatest flexion. By the eighteenth experiment, the curve had changed again, becoming very vigorous, large in extent and higher in rate, and the extension por-

tion was rounded, while the flexion portion of the curve tended to run to a peak. This characteristic increased throughout the records. Both the experimental and control period curves changed at about the same time, with the experimental periods changing slightly ahead of the controls.

The Martele Series

The martele technique on the violin produces a sound of great volume with very little crescendo effect, an instantly loud sound, giving a very definite auditory shock. This series was suggested because of previous success obtained by using orchestra bells. The martele experiments fell haphazardly throughout the rest of the experiments. The conclusions here developed are contingent upon the total experimental sequence described since there is no way of judging whether the martele series would have been successful in producing remissions of tremor as an independent series. It is the opinion of the authors that the conditioning effect of the other experiments was necessary.

It was generally concluded that isolated sounds of an instantly loud character as used in the martele series produced an experimental situation entirely different from the regular series of experiments. Production of tremor movement was positive and certain. Remissions from tremor were definitely under the control of the experimenters. Although this portion of the series was not controlled adequately, it seemed to be possible to follow the flexion curve of the subject during remission, strike a note as this tension began to increase, and by several repetitions produce as long a remission as was desired under the conditions of the apparatus. An analysis of the martele experiments, in contradistinction to the remainder of the series, showed little or no significant difference with respect to time of occurrence in the series, type of stimuli, or other changes in the situation. These conclusions are presented only to clarify the study as a whole and must be accepted as tentative.

DISCUSSION

A NUMBER of significant questions are raised by the foregoing data and conclusions.

1. Occasionally during the series when a familiar sound sequence returned suddenly, the rate of the tremor increased. Since it was shown that increase in rate, i.e., control of the tremor by sound stimuli, was requisite for tremor remission, would deliberate experimental sequences of this sort increase the rapidity of control?

2. The success of the martele experiments, with their instantaneously loud sounds, and the apparent fact that the time interval between them is unimportant, leads to the question: What would happen if a loud bell were simply to be rung at regular intervals for a long period of time? Or were the intervals of time more significant than supposed?

3. The series is inconclusive on the effect of pitch. Does a lower pitch produce a greater effect? Does the tremor pattern change with change in pitch? On the experiments in which steady tones were played at relatively long durations in scale, there appeared to be changes in the curve pattern of the tremor at points near the changes in pitch.

4. The fact that pauses in the tremor usually occurred at a point of extension of the finger, and that resumptions of tremor usually occurred after some flexor tension had developed, leads to the question of developing new techniques specifically aimed at producing the requisite extension or flexion.

5. From experiment 18 on, with the exception of the martele series, the sound stimuli were related primarily to the extensor portion of the tremor. In the martele series, the stimuli were related to the flexor portion. Since the martele series only produced results on

flexion, and the results were better than in the other series, would rhythmic music related to the tremor be more effective if related to the flexor portion of the tremor?

6. One whole segment of the data has been omitted from the report—that concerned with the pattern of movement. It has been noted that the entire character of the tremor changed at experiment 11a, and it was only at experiment 18 that the series began to be successful. Is such a pattern change necessary for successful results, and what is the significance of the pattern changes? What do the sinusoidal waves, the fibrilations, the respiratory-like curves, etc., mean relative to this problem?

7. After the tremor pattern had become vigorous and stable, the most vigorous movement in the tremor was the flexor portion. Any delay between tremor movements usually occurred during extension, not during flexion. Could this be used as a teaching device?

8. After the tremor had become conditioned, any stimuli with the exception of the martele technique on the violin produced about the same kind of a tremor, although slow soft music was not so effective as vigorous music. What predetermines this effect?

9. In these records it was impossible to determine with any exactness the point on the tremor at which the stimuli was stopped. Perhaps the small variations in the results may be due to differences in the places where the music was stopped. The authors feel that their records show that the music must cease at extension, or shortly before.

10. The introduction of another observer in experiments 100 to 107 caused obvious changes in the results. Statistically, the results paralleled other experiments. On a practical basis, some provision should be made for this additional stimulus.

11. When the subject was uncomfortable (*vide* 79), when there was coughing, etc., the results were never as good. Any further experimental series should investigate more deeply the question of endogenous stimuli.

12. Pauses infrequently occurred during experimental periods. If the stimuli had been stopped at these places, would longer remission have occurred?

13. Why should there have been a predictable rate, and what were the determinants of this rate?

14. In the control periods it was noticed that return of tremor tended to occur at the same places where it had occurred in previous experiments. Would the techniques have been more or less effective if the control periods had been equal in time?

15. It is obvious that the reports in the literature of the effect of music on cerebral palsy have not been based on objective study. Nearly every commonly held theory has been controverted in the study of this one subject. The question is (and this question refers to the whole study), will this type of research produce similar results in more severe cases, or even in similar cases?

16. While it is an over-extension of application, it is probable that the effects of music on normals working in highly skilled trades have been misunderstood. Should not the music used in industrial workshops be re-evaluated in terms of its effect upon skilled habitual muscle action?

17. The relationship of this series to the study of normal individuals is a very broad question with many ramifications. The vibrato used by the violinist, the normal human tremor, and muscular repetitive action in general need to be studied in relation to these findings.

18. Finally, would similar techniques be of benefit in the treatment of paralysis agitans and similar conditions?

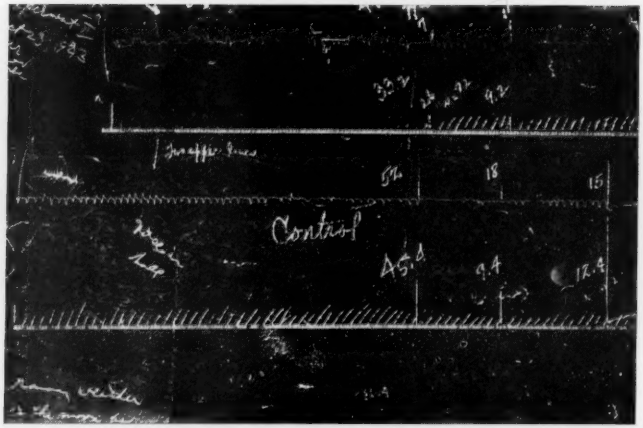

FIGURE 1. Upper line, control period prior to experiment No. 4 and beginning of experiment No. 4. Second line, time at 1/5th second. Third line, control period prior to experiment No. 6 (note change in pattern). Beginning of experiment No. 6. Fourth line, time at 1/5th second.

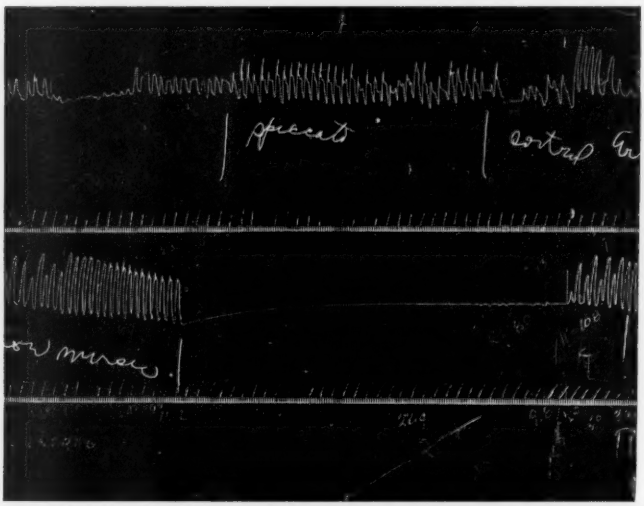

FIGURE 2. Upper line, control preceding fifth repetition of spiccato à ricochet in experiment No. 25—spiccato à ricochet, failure of control period following the spiccato (arm and shoulder tremor). Second line, time at 1/5th second. Third line, second experimental period of experiment No. 29 ('Siciliano, by Kreisler). Control period following showing characteristics of remission curve. Note change of pattern in this successful experimental period. Fourth line, time at 1/5th second.

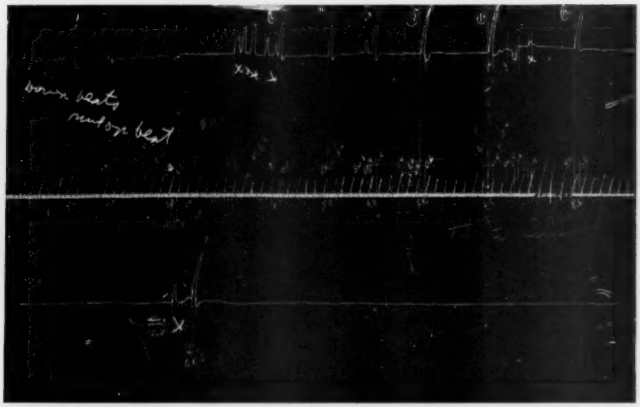

FIGURE 3. Upper line, notes 1 to 10 in experiment No. 119. Note single tremor movement at every note of violin. 'x' below the line refers to tremor movements not accompanied by sound. Second line, time at 1/5th second. Lower line, remission preceding and following note 15 in experiment No. 120.

SUMMARY AND CONCLUSIONS

A YOUNG adult male, with cerebral palsy, presenting a typical athetotic tremor of the right index finger, was subjected to a series of 126 mainly auditory stimuli of varying lengths under controlled conditions. It was possible to increase and control the severity, rate and stability of this tremor by means of sound (and visual) stimuli. When such an increase in the tremor had occurred, it was discovered that sudden cessation of the stimuli (rhythmic, arrythmic, musical, not musical, etc.) produced remissions of the tremor for considerable lengths of time. Instantaneously loud sounds, produced as described above, gave the best results. Remission following the experimental series lasted for six weeks.

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War Notes

Harold Westlake, Editor*

THE CESSATION of hostilities is beginning to have its effect on the rehabilitation programs of the Army and the Navy. The expectancy is that some units will be disbanded and that others will operate with gradually reduced loads. Rumors of changes, many of them conflicting, have reached the Committee, but at the present the only confirmed report is that the Navy will not open the new rehabilitation center at Long Beach, California. The plan was to build up a large unit on the west coast, paralleling the one at the Naval Hospital at Philadelphia.

Anticipating the developments in the program, it is to be expected that the bulk of the work will gradually shift to the Veterans' Administration. Early communications on the Army program definitely indicated that it was intended to carry through a transitional period. The following are excerpts from an early communication from Lt. Col. Marion R. Mobley, Chief, Eye, Ear, Nose and Throat Section, the Army Medical Center, Walter Reed General Hospital, Washington, D. C., dated July 20, 1945:

> Inasmuch as the Veterans' Administration has been designated to carry out a rehabilitation program, why should the Army also undertake this special work? Oftentimes, the onset of deafness is coincident with convalescence from severe medical illness, which will confine a patient in a hospital for a long period of time. It may also be associated with complicating wounds which require long periods of hospitalization. Early treatment which restores some of the patient's confidence and optimism will do much to shorten the rehabilitation period. It is for this reason that the program is to be begun in an Army hospital instead of waiting for a later period.
>
> It is not the intention of the Army to take over the entire rehabilitation program; that is still the province of the Veterans' Administration. During the time that the patient is arriving at a point of maximum therapeutic benefit, his leisure time will be utilized toward securing re-educational training.

In line with this expected trend, the Committee is again contacting Veterans' Administration centers to inform them of the willingness of the ASCA to be of service and outlining the services Society members can offer. A careful outline of the legislation under which the Veterans' Administration functions was presented in Vol. 9, No. 4 of the *Journal* (Dec., 1944).

The Committee has received requests for lists of people now in the Army who are qualified to work with aphasias. It will be helpful if members who know of such persons will send their names, and if possible their addresses, to the Committee.

*Professor Westlake (Ph.D., Michigan) is on the staff of the Speech Clinic, School of Speech, Northwestern University. He is a member of the Council, ASCA, and chairman of the Association's Committee on Rehabilitation.

JOURNAL OF SPEECH DISORDERS, 1945, 10, 321-328

Speech Correction Services In State Welfare Programs

Elmerine Sherman Flint*

PRIOR to World War II, there was a growing interest in the development of state-wide programs for the rehabilitation of the crippled child. The aim of these services was to restore abilities to the physically handicapped that would permit them to lead well-adjusted and productive lives. The integrated program was designed as a rule to include physiotherapy, visual and auditory aids, vocational rehabilitation and speech therapy.

In spite of the war, a number of such state programs have been organized and developed, and others previously instituted have been continued. Possibly speech services have lagged behind the others for various reasons, but it is encouraging that at the present time several states through their departments of social welfare provide speech services to the crippled child. Many states have been delayed in plans to establish speech programs because of the lack of available trained speech correctionists. Some have been forced to discontinue temporarily their speech program until correctionists become available.

The information presented below summarizes speech correction services provided, as of August, 1945, through state departments of social welfare. It has been secured through correspondence with the departments of social welfare of each of the 48 states and represents the consensus of the department chiefs. Responses were not received from all of them, however.

Alabama

The Department of Public Welfare administers no facilities for speech correction services. The children having speech defects are referred to the State Department of Education, State Crippled Children Services at Montgomery. The only speech correction which is available is for spastic cases who are admitted to the Charlanne School, Birmingham.

Arizona

The correction program consists of speech therapy as part of the cerebral palsy program. Individual speech therapy for children with cerebral palsy, congenital malformations of the mouth, or any other defects which require special therapy to improve speech is provided by a speech pathologist and two trained assistants. Fees are $35 per month for three one-half-hour treatments per week. The patients come to the correctionist for treatment; the correctionist does not travel.

Arkansas

There are no speech correction facilities in the Department of Public Welfare.

California

The Department of Public Health, Crippled Children Services, does not offer any speech correction services. A state-wide program for children suffering from cerebral palsy is being planned, and speech correction will be included as a part of that program. This is not yet under way.

Colorado

No response to written inquiry was received.

*Elmerine Sherman Flint (M.A., Alabama) is Speech Pathologist, Crippled Children Services, Division of Social Welfare, Minnesota State Department of Social Security, St. Paul, Minnesota. The information presented in this paper was obtained from the informants listed at the end of the paper.

Connecticut

Speech training is provided in Connecticut for the child having speech defects due to harelip or cleft palate and cerebral palsy by the speech teacher of the Division of Crippled Children at several centers throughout the state on designated days, and by the speech teacher at the Newington Home for Crippled Children. In exceptional instances speech training is provided in the patient's home or foster home.

Consultation is given to school superintendents and teachers on speech problems, particularly in stimulating speech services for school children with speech defects other than those associated with cleft lip, cleft palate and cerebral palsy.

A functioning unit for the teaching of physically handicapped children is in effect in Bridgeport. This plan consists of cooperation between the Board of Education of the city of Bridgeport and the Division of Crippled Children. Children who are physically handicapped receive occupational therapy at the Bridgeport Workshop under the auspices of the Connecticut Society for Crippled Children and in the same building receive instruction under the local Board of Education. The speech teacher of the Division of Crippled Children spends one day per week with the class working with children who have cerebral palsy.

A fee of $1.30 per lesson is paid to the Newington Home for Crippled Children for speech lessons given by their speech teacher to patients of the Division of Crippled Children having cleft lip, cleft palate, or cerebral palsy.

Delaware

The State Board of Welfare of Delaware provides speech correction services through the state school system only. At the present time this is limited to a much greater extent than is wished. There is also a limited service through the mental hygiene clinic of the Delaware State Hospital at Farnhurst.

District of Columbia

The crippled children program does not at this time include services for the correction of speech defects. There is a limited service on a therapeutic level for children who are being treated for cerebral palsy.

Florida

The State Welfare Board has no speech correction services.

Georgia

The State Department of Public Welfare in Georgia has no speech correction services. The children in need of speech correction under the Crippled Children Services are taken to Atlanta for stay in a convalescent home and then are given speech instruction at the Junior League Speech Clinic. The Junior League Speech Clinic has a staff of five. League volunteers help the teachers in the classrooms and do secretarial work. There is no age limit and the aim is to teach the child until he is able to adjust to regular school routine. Each child is expected to pay as he is able and those unable to pay are assisted by the Fulton County Board of Public Welfare.

Idaho

The Department of Public Assistance of Idaho has no facilities for speech correction. This is recognized as one of the most urgent needs and the department is interested in developing speech services as soon as possible.

Illinois

In Illinois two approaches to the speech rehabilitation of the handicapped child have been made: (1) amendment has been secured of the state's legislation which provides aid to local school districts for special educational services for crippled children (the speech defectives are a sub-group of the physically handicapped group); and (2) the Division of Services for Crippled Children conducts demonstration clinics in which it serves the crippled speech defectives and demonstrates how the non-crippled speech

cases can be served if the community will avail itself of the services of qualified speech correctionists. There are now 32 speech correction centers in addition to those at the University of Illinois, Northwestern University, Rockford College, and other educational institutions in the state. The special education program of the State Department of Public Instruction is developing rather rapidly, however, and by the time this article goes to press the number of public school speech correctionists in Illinois will undoubtedly have increased. The speech correction services of the Division of Services for Crippled Children are also being expanded independently and in relation to the public school program.

Indiana

The Department of Public Welfare refers children with speech defects to the mental hygiene clinics in the state. The mental hygiene clinics are operated and staffed by the Division of Mental Hygiene of the Indiana State Department of Public Welfare, with headquarters in Indianapolis. There are two full-time clinics, one in Gary and the other in Indianapolis. In addition, there are eleven mobile clinics which serve in different areas in the state on regularly scheduled dates each month. A clinic team is composed of a psychiatrist, a psychologist and a psychiatric social consultant. There is no one on the staff who is primarily a speech correctionist, but those of the staff who do work in the area of remedial reading give whatever help is given in the area of speech correction. Speech correction is incidental to the work with reading disabilities or other clinical problems. Clinic service is made available primarily for the benefit of patients who are unable to afford private psychiatric guidance or treatment.

Iowa

The Division of Child Welfare of the State Department of Social Welfare maintains a staff of field workers who refer children from time to time to the Universtiy of Iowa Speech Clinic. The major contribution of this division is provided through a social worker who is stationed in Iowa City and whose office is at the Speech Clinic. This worker provides for boarding home care and general out-of-clinic supervision of children who are referred to the speech clinic for remedial instruction.

Other agencies with which the Division of Child Welfare and the University Speech Clinic cooperate are the State Society for Crippled Children; the State Department of Public Instruction, especially through its newly instituted special education program; Crippled Children's Services, headquartered in the University of Iowa College of Medicine, which conducts clinics out over the state in which speech correctionists from the University Speech Clinic and the Iowa State Teachers College frequently participate; the University Hospital in Iowa City, to which children are referred by the Division of Child Welfare and which provides speech examination and correction service through (a) two staff members who are part time in the departments of Otolaryngology and Psychiatry, respectively, and part time in the Speech Clinic, and (b) hearing clinics conducted by the Department of Otolaryngology with the cooperation of the State School for the Deaf, Council Bluffs, and the University Speech Clinic.

Kansas

The Kansas State Board of Social Welfare provides $6,000 for the purpose of assisting the Institute of Logopedics at Wichita in its program for the state of Kansas. This institute gives corrective services to a limited number of children, from the counties of the state, whose parents are unable to pay for such services. The work has been exceedingly satisfactory since the fund was set up. However, it is not within several thousand dollars of being adequate.

Kentucky

Children having speech defects and orthopedic conditions are referred by the State Department of Welfare either to the School for the Deaf at Danville, Kentucky, which is under the Department of Education, or to the Crippled Children's Commission, Hayburn Building, Louisville. The latter is a private agency with the State Board of Health. However, at the present time the Crippled Children's Commission does not have a class in speech correction. Their program consists mainly of physical restoration.

Louisiana

The Department of Public Welfare has no speech correction service. Children with speech defects are referred to a special speech clinic in New Orleans. The expense of this correction is not met by the state.

Maine

The State of Maine Services for Crippled Children employs on a part-time basis one speech therapist. Her services are available for any crippled child who has a speech difficulty. Speech deficiency alone does not make a child eligible for speech training under the Maine program. The speech therapist works in the wards at the Children's Hospital and holds clinics on an out-patient basis. These children are seen periodically. During the summer months a concentrated program of two weeks' duration is given. The Department of Speech at the University of Maine offers speech therapy courses during the summer session and the Services for Crippled Children is able to send a limited number of children to the University to be demonstration patients for the students enrolled in these courses.

Maryland

No response to written inquiry was received.

Massachusetts

There are no speech services available through the Department of Public Welfare of Massachusetts.

Michigan

There are no facilities for speech correction from the Social Welfare Commission of Michigan. Speech defectives are provided speech correction by the Department of Public Instruction, Division of Speech Education. In 1941 the School Code was amended to provide instruction for speech defectives and it is now possible for the Board of Education in any school district to establish services for speech defectives. Correction is given by trained clinicians in the public school system.

Minnesota

The State of Minnesota, Division of Social Welfare, Crippled Children Services, employs two full-time speech pathologists, one of whom is stationed at the University of Minnesota Hospitals, Out-Patient Department, and the other travels throughout the state providing speech services to rural and urban crippled children.

The central clinician's duties are threefold: (1) she gives speech training to the Ramsey and Hennepin County crippled and speech defective children; (2) holds clinics at Gillette State Hospital for Crippled Children two days per week; and (3) examines all plastic post-surgical cases for diagnosis and evaluation of speech problems upon the recommendation of the plastic surgeon at University Hospitals or Gillette State Hospital.

The itinerant clinician (1) organizes and maintains monthly field speech clinics in the several counties of Minnesota for the crippled children who are also speech defectives: (2) acquaints the social agencies, public schools, parents and the public in general with the Crippled Children Services speech program; and (3) sees for one time only for diagnosis and recommendations any non-orthopedic child having a speech defect who has been referred to a field clinic by the county nurse, medical social worker, or family physician.

The two workers jointly conduct an

intensive eight-week summer clinic for post-operative cleft palate cases, of 12 to 16 years of age, at University Hospitals, Psychiatric Clinic for Children.

There is no charge for field speech service. For an examination by the speech clinician at the University Hospital there is a fee of 25 cents. There is no charge for the summer clinic, except for the personal expense of board and room, carfare and incidental expenses for each child.

Mississippi

There are no speech correction services in the Mississippi Department of Public Welfare.

Missouri

There are no speech correction services in the Department of Public Welfare. The Department of Education at one time conducted speech clinics throughout the state, but these have been discontinued temporarily due to the limitations of travel. There are 30 speech correctionists working in individual schools in the state whose services are available to anyone in the district desiring them.

Montana

No response to written inquiry was received.

Nebraska

The Department of Assistance and Child Welfare does not operate any facilities for speech correction, but there is a speech correction department at the University of Nebraska. Any agency may refer both children and adults directly to this department for diagnosis and speech treatment. The department also holds diagnostic clinics in some of the counties if requested to do so.

Nevada

No response to written inquiry was received.

New Hampshire

The Crippled Children Services of the Department of Public Welfare does not offer any speech services.

New Jersey

No state-wide services are provided by the State of New Jersey in speech correction except for the services rendered by the New Jersey School for the Deaf. Speech clinics in the various parts of the state were maintained until recently but were discontinued due to traveling conditions and shortage of personnel.

New Mexico

The Department of Public Welfare does not have facilities for speech correction services.

New York

Speech correction is provided by the Bureau of Physically Handicapped Children, State Education Department. The program comprises two parts: (1) Many children who have cleft palate or harelip deformity are given the necessary plastic surgery and orthodontia as indicated to correct the deformity. This service is usually carried on through the court order procedure. (2) The second phase of the work is an attempt to secure properly qualified teachers in the speech correction field so that these children, after the surgical phase of the work is completed, can be given speech correction in an effort to improve their general speech. In some instances this service is cared for through the court order procedure; in other instances the local board of education hires teachers who are capable or qualified to carry on this intensive speech reeducational program. For the past several years there has been in operation in the city of Ithaca, New York, a summer clinic for children with speech defects. This summer clinic affords an opportunity for children with serious speech defects to receive the benefit of an intensive speech correction program. All the children who go to this summer clinic are sent there through an order of the Children's Court. In addition to these services, a number of cities throughout the state, including New York City, have hired speech correctionists and they are working with children in the

school community in an effort to correct speech defects.

North Carolina

The State Board of Public Welfare does not have speech correction facilities.

North Dakota

Although North Dakota does not hire a speech pathologist directly, the Public Welfare Board of North Dakota provides for speech correction of a limited number of crippled children at the Crippled Children's School at Jamestown. This school is privately owned and the speech correctionist is hired by the school.

Ohio

No response to written inquiry was received.

Oklahoma

The State Department of Public Welfare has no speech correction services. The Crippled Children Commission is planning to employ a speech correctionist, and when this is done the welfare department will be able to refer children to her.

Oregon

In Oregon one full-time speech pathologist is employed by the Crippled Children Division of the University of Oregon Medical School (1) to consult with various agencies, doctors and orthodontists concerning problems related to defective speech; (2) to examine cases, make diagnoses and advise parents and others concerning the child's care; (3) to carry on a program of clinical training at the University of Oregon Medical School; and (4) to assist in educational programs designed to acquaint public school teachers and the public in general with the problems of speech rehabilitation and the methods and facilities available.

Under the Oregon program (as is also true in Minnesota) the pathologist is permitted to examine and advise any type of speech case under 21 years of age. However, if the case is to be accepted for training, the defect must be organic in causation or of such a nature as to arise directly from, or be closely associated with, a crippling condition.

There is no charge for examination and consultation. There is a fixed fee of $2 per lesson with a maximum of $25 per month if training is given. The family may pay all, or none, or any portion of this fee depending upon its financial ability.

Pennsylvania

Speech correction and care of the acoustically handicapped is provided by the Department of Public Instruction. The Department of Social Welfare may refer children with speech defects to the Department of Public Instruction for correction.

Rhode Island

No response to written inquiry was received.

South Carolina

The Department of Pubilc Instruction has no speech correction facilities.

South Dakota

The Department of Social Security has no resources for speech correction.

Tennessee

There is no state program for speech correction, as such, but state-wide institutes for the care and education of the exceptional child, particularly the crippled, the speech defective, the partially sighted and the hard of hearing, are sponsored by the Crippled Children Services of the Department of Public Welfare along with other state correction agencies.

Texas

No response to written inquiry was received.

Utah

No response to written inquiry was received.

Vermont

No response to written inquiry was received.

Virginia

No response to written inquiry was received.

Washington

No response to written inquiry was received.

West Virginia

The State Department of Public Assistance does not have speech correction facilities.

Wisconsin

One speech therapist is employed by the Wisconsin Department of Public Instruction in the Bureau for Crippled Children. Since 1943 the Bureau has sponsored a six to eight weeks summer speech course at the speech training center in Madison for post-operative cleft palate cases of 3 to 14 years of age. During the remainder of the year, the correctionist visits children, parents, nurses and teachers.

Wyoming

There are no speech correction facilities in the Department of Public Welfare although the health, welfare and education departments all feel the need of speech services. The Crippled Children's Division of the State Department of Health sponsors speech training clinics each summer for children accepted for orthopedic or plastic care, especially those suffering from cleft palate and lip. This clinic runs for approximately five weeks, and is held at the University of Wyoming. Individual instruction is given to each child who attends the clinic under a specialist trained in correction work. A few teachers in the state have had special speech training, but there is no overall or continuous service in speech correction.

LIST OF INFORMANTS

Alabama: Thelma McGinty, Supervisor, Crippled Children Services.
Arizona: Lillian Retzloff, Administrative Assistant, Crippled Children Division.
Arkansas: Bernice G. Ratcliffe, Director of Child Welfare.
California: Jessie M. Bierman, Chief of Department of Public Health.
Connecticut: Louis Spekter, Chief of Division of Crippled Children.
Delaware: Norma Philbrick, State Supervisor, Child Welfare Services.
District of Columbia: Ella Oppenheimer, Director, Bureau of Maternal and Child Welfare.
Florida: Frances Davis, Supervisor, Division of Child Welfare.
Georgia: Maria D. Harper, Medical Social Consultant, State Department of Public Welfare.
Idaho: Janet Smith, Supervisor, Child Welfare Services.
Illinois: Lawrence J. Linck, Director, University of Illinois Division of Services for Crippled Children.
Indiana: P. R. Gallup, Director, Division of Mental Hygiene, Department of Public Welfare.
Iowa: Wendell Johnson, Director of Psychological and Speech Clinic, University of Iowa.
Kansas: Martin F. Palmer, Director of the Institute of Logopedics.
Kentucky: Marian Williamson, Director, Crippled Children Commission.
Louisiana: Betty Ford, Medical Social Consultant, Department of Health; Edith G. Ross, Director of Local Welfare Services.
Maine: Herbert R. Kobes, Director of Medical Services, Department of Health and Welfare.
Massachusetts: Agnes M. Forman, Supervisor, Child Welfare Services.
Michigan: Gunner Dybwad, Supervisor, Children's Division, Social Welfare Commission; John S. Hitema, Chief, Special Education Division, Department of Public Instruction.
Minnesota: Edwin J. Simons, Chief, Medical Unit, Crippled Children Services, Division of Social Welfare.
Mississippi: Sara P. Ricks, Director, Division of Child Welfare.
Missouri: Minnie Alper, State Casework Supervisor, State Social Security Commission; Lynn E. Hummel, Director of Fine Arts, Department of Public Schools.
Nebraska: Dorothy V. Swisshelm, Chief, Division of Child Welfare.
New Hampshire: Viennie Barton, Supervisor, Child Welfare Services.
New Jersey: Sanford Bates, Commissioner, Department of Institutions and Agencies; C. M. Jochem, Superintendent, New Jersey School for the Deaf.
New Mexico: Lois S. McVey, Supervisor, Child Welfare Services.
New York: Elizabeth Culver, Supervisor of Child Welfare; Joseph Endres, Chief, Bureau of Physically Handicapped Children, State Educational Department.
North Carolina: Helen Hall Smith, Supervisor, Child Welfare Services.
North Dakota: Florence L. Scott, Consultant, Orthopedic Nursing, Division of Child Welfare, Crippled Children Services; W. B. Schoenbohm Superintendent, Crippled Children School.

Oklahoma: Elizabeth K. Starkweather, Child Psychologist, Department of Public Welfare.
Oregon: Claude E. Kantner, Speech Pathologist, Crippled Children Division.
Pennsylvania: Francis B. Haas, Department of Public Instruction.
South Carolina: Arthur B. Rivers, Director, Department of Public Welfare.
South Dakota: Grace W. Martin, Director, Division of Child Welfare.
Tennessee: R. H. Hutcheson, Commissioner, Department of Public Health; Roberta Miller, Director, Child Welfare Division.
West Virginia: Mae S. Straton, Acting Chief, Division of Medical Services, Department of Public Assistance.
Wisconsin: Frank V. Powell, Director, Bureau for Handicapped Children.
Wyoming: Grace Taylor, Child Welfare Supervisor, Department of Public Welfare.

News and Announcements

(Continued from Page 292)

The Research Corporation of New York announced October 9, 1945, that it would make available $2,500,000 in grants for research to educational institutions.

Research Corporation was begun in 1912 with the gift, through Dr. F. G. Cottrell, of patent rights on electrical precipitation, which is used for removing dust, fume and mists from industrial gases and from the atmosphere. From revenues derived from these and other patents it has made grants of $1,279,637 in past years to 52 institutions. In recent years Research Corporation has served universities by administering inventions that may arise in their laboratories.

To scientists of the Office of Scientific Research and Development, Army, Navy and other war research agencies, as well as colleges and universities, the possibilities of these grants are being made known with an invitation to send applications to Dr. Robert R. Williams, Research Corporation, 405 Lexington Avenue, New York 17, New York.

PERSONALS

Dr. Jean L. Utley has opened an office in downtown Chicago for a practice limited to the educational aspects of hearing problems, including speech, lipreading and acoustic training of children and adults. Dr. Utley is a recent graduate of the School of Speech, Northwestern University.

Mrs. Rachel Dawes Davies has joined the staff of the Western Reserve University Speech and Hearing Center, where she will teach courses in the education of the deaf and hard-of-hearing child. Mrs. Davies was formerly Director of Instruction, Central Institute for the Deaf.

Miss Elizabeth MacLearie, teacher of Speech Correction in the Cleveland Public Schools, was guest instructor in speech at Phillips University, Enid, Oklahoma, this past summer. She taught the Jena Method of speech reading for adults and voice and speech improvement.

JOURNAL OF SPEECH DISORDERS, 1945, 10, 329-334

Treatment of a Child With Delayed Speech

Lorna Shogren Werner*

THIS paper concerns a five-year-old girl who had never uttered a sound. She was referred to the writer by a visiting teacher (who served as school psychologist) at the time of her enrollment in a public school kindergarten. Weekly lesson periods of one hour were scheduled with the speech correctionist, and these continued until spring of that year. During the summer, the child attended a pre-school play group under the direction of another kindergarten teacher in the system. In the fall, she was enrolled in the kindergarten of her summer teacher. Two months later speech lessons were resumed. The speech correctionist saw the child for an hour twice a week. Subsequently this time was divided into slightly shorter periods three days a week. These lessons are still continuing, though they are now scheduled for twice a week. The present report covers the period from September, 1943 to April, 1945.

CASE HISTORY

INDIVIDUAL conferences with the mother and father of the child, followed by discussions with the visiting teacher, brought out the following data.

This child is the youngest of three children. The mother reported that the birth was a difficult one and that the child was unwanted by her. The mother was undoubtedly in a state of great mental agitation at the time. The father made the statement that the child had never uttered a sound—not even a cry, although he quoted the pediatrician as saying that if she ever made a sound, she would talk. From infancy the child had been weak and under-nourished. Probably her physical condition slowed down the normal process of speech readiness, so that she was unable to develop speech at the usual age. There are two older children in the family. A girl of 12 and a boy 8. Both of these children evidence behavior patterns which might be expected of unsupervised children, but they are normal youngsters as far as speech or any other relevant observable characteristics are concerned. The economic status of the family was average. They had recently moved into a smaller house, which was not adequate to their needs, and the three children had to share the same room.

Information concerning the child's early life has been pieced together mostly by observing present behavior tendencies of the family. It is felt that she was largely rejected or ignored by the mother, except for minimum attention to her physical needs. The mother made a statement, which was later confirmed by the father, to the effect that she was silent most of the day, not being in the habit of talking to anyone while she worked. The father worked long hours and was in the home little of the time. The attitude of the older children toward this child during the early years is not known, but their treatment of her probably was not consistent. It is certain that she came in for her share of teasing and rejection by them. A neighbor reported that children in the neighborhood were 'mean' to this child.

Our subject was undoubtedly con-

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sidered 'defective' by the parents and other observers. This attitude was probably sensed by the child, perhaps discussed in her presence.

DESCRIPTION OF THE CASE

AT THE TIME of referral the child did not have a normal appearance. She was thin and obviously undernourished. Her eyes were weak, subject to infection, and had deep circles beneath them. As observed in the kindergarten her eyes had a 'peculiar' expression and did not seem to be focussed on anything to which the other children were attending. She was subject to frequent colds, and nosebleeds were quite common. Malnutrition and lack of sufficient sleep were the two factors which seemed to contribute to her general condition. Repeated talks with the parents, and a discussion with the pediatrician under whose care the child had been, seemed to have little effect upon parental attention to these needs. The difficulty seemed to be that the child would not eat properly and refused to go to bed until ten or eleven o'clock at night. Unfortunately, early retirement was difficult as the three children had to sleep in the same room—this child in a crib. In spite of her physical condition, the child was very active. Her muscular coordinations seemed normal, and her movements were quick and accurate. The mother told the correctionist with considerable apology during the first interview, 'I think she's smart.' Certainly, from the first, she exhibited a good understanding of things that were said to her and an ability to follow those directions which she wished to follow. It is possible that, lacking the general maturity for speech development during the period when speech acquisition is expected, and receiving little of the needed encouragement from the family to begin the speech imitative process, this child never tried to talk. Later, the mother may have become concerned about the child's inability to speak and tried to *make* her talk. Certain pressure techniques were probably exerted from other sources also, which caused this child to adopt a negative attitude toward speech. She developed such a negativism toward speech that any attempt to encourage talking caused her to hide her head, draw off to herself, or run away.

She showed a keen interest in books. She had a great deal of curiosity for the things around her, particularly anything mechanical, which she promptly wanted to make 'work.' She showed a good ability to reason out how to make these objects function. She had an excellent memory and an unusual ability to make associations. For instance, one day in walking out of the school building she heard a song which had been used earlier in the year in kindergarten. She stood stock-still and would not move until the song was ended. At another time, she came across a picture of a piece of pie in one of the books being used during a lesson. Quick as a flash, she was up from the divan, had opened the drawer of a secretary in the room, rummaged through the miscellaneous collection, to bring back one cut-out section of a picture puzzle showing a piece of pie.

From such observations as these, it seemed to the writer that the child's intelligence was adequate, and that if the psychological barrier could be lifted, she could learn to talk. However, from the standpoint of her contacts with school personnel, she gave every indication of being an abnormal child—her appearance, behavior and lack of speech gave that impression. Nevertheless, it seemed that every opportunity needed to be taken to give her the chance to overcome her present handicaps with respect to speech and normal behavior.

TREATMENT

IT WAS apparent that no direct approach to speech could be made. It was hoped that in a play situation, where no attention would be centered

on the child herself, she could be stimulated to imitate some oral response of the teacher. The first lesson was spent in looking at picture books. It was an unusual experience, for the child uttered not a grunt or sound of any kind, neither laugh or cry. It was during the second lesson that the first sound was brought forth. After considerable repetition by the teacher, the child uttered a 'boom' in imitation of the teacher's interpretation of the sound made by closing a roll-top desk. The child opened and closed that desk many times, getting pleasure from the sound it made and the teacher's response of 'boom.' The following lesson elicited a 'boom' to books that were dropped, a door that was slammed, in fact to any noise. This first sound by our subject had a quality such as one might expect from an unused mechanism. It was lacking in inflection and had a harsh throaty quality.

Using that first word as a springboard to get her used to the sound of her own voice, other words were stimulated through play situations. We were limited to the noises of objects or animals, because any attempt to put speech on a personal basis met with instant withdrawal. Among her first sounds were *ee* (mouse), *baa* (sheep), *zh* (zipper), *oh, bye, mamma, e* (yes). Gradually, she developed an ability to give all the sounds of animals—*hee haw* (horse), *moo* (cow), *oi* (pig), *peep* (bird), *bow-wow, meow,* etc. Games were played with toy animals, making them talk to each other in their own language. She was beginning to get satisfaction from hearing her own voice. She began to pick up, through working with picture books, the names of various objects, although she was always careful to avoid or abbreviate words of more than one syllable.

Speech still had to be kept on a voluntary basis. Pointing to a picture and attempting to draw forth a specific response resulted in her turning the page to avoid the issue. If further insistence was made, she hid her head or ran away, and no further speech could be expected for the rest of the lesson. The technique apparently had to be that of going through books and giving her the opportunity to imitate names of objects that she pointed to and voluntarily identified.

Attempts to encourage this volunteer word-calling when anyone else was present, or asking her to give a word which seemed a natural outgrowth of some environmental situation, resulted in the same negativism. The child still showed no inclination to use her vocabulary in the kindergarten. Her pronunciation of the words which she did offer in looking at pictures was often just a suggestion of the word, at first only the vowel or a simple consonant with the vowel.

GRADUALLY the child became more spontaneous in identifying book pictures. She began now to volunteer the names of familiar objects by way of displaying her newly acquired ability, unless it was a word of several syllables which sounded difficult to her. The mother reported at this time a variety of words volunteered to the family in reference to specific items in the home.

All this time the child attended kindergarten regularly. In her effort to help the children understand this child's problem, the teacher had told them our pupil could not talk. Unfortunately, the children volunteered this information to the speech correctionist during one of her visits to the room to direct oral work with the group. Having the children regard her as abnormal in this way may have further strengthened the child's inhibition to try to talk. She seemed to enjoy being with the other children, however, and, though she did not enter into many of the activities, she seemed fairly happy in this school environment.

In the home situation and during

the lesson period her vocabulary was increasing. She was using words spontaneously, and she seemed to be making consistent progress in the one-word stage. Since this was all that was expected at the time, it was decided to discontinue special speech lessons for a while to see if the child would continue to develop in regard to speech fluency.

However, the speech correctionist continued to observe her at school each week. During the latter part of the school year, an attempt was made to give her increasing social opportunities. She was taken to visit other kindergartens in the system, since her own group was too large for her to get much individual attention. She adjusted nicely to these experiences and entered into the free activities.

During the summer, our pupil attended a preschool class, which met for directed play each morning. In the fall, she was placed in the kindergarten of her summer teacher. She fitted in well with the children, and they became much attached to her. They waited on her, helped her get into and out of her wraps, and sought her out for play. She enjoyed taking small responsibilities like passing out cookies, paper, etc. At first she had to be urged to take her place with the other children for the directed activities. She preferred to go off on her own tours of investigation or play by herself, rather than to sit on the floor listening to stories, poems, or songs. She did not participate in these periods where oral response was encouraged from the children, although she has recently responded occasionally to a song at the teacher's insistence.

She was still subject to frequent colds, was underweight, and had repeated nose-bleeds. She was often exhausted from insufficient sleep. Also, there would be times when she would revert to her old behavior, draw up within herself, and refuse to participate with the group, or respond to the teacher's attention. These days corresponded with 'bad' periods at home. The child reflected her mother's more serious states of mental disturbance. These changes were observed in the varying fronts presented by the mother to the speech teacher, although most of the time the mother 'covered up' fairly well in the teacher's presence.

IT WAS HOPED that association with the kindergarten teacher and the friendly children would encourage her to talk. She seemed, however, to be on a plateau. She used her one-word form of speech freely, but made no effort to use long words or more than one word at a time. The child's state of progress was discussed with the parents, teacher and visiting teacher. It was agreed by the consulting teachers that the mother's condition and the home situation were the disturbing factors, but no immediate solution seemed possible. It was the opinion of this group, who were, of course, not trained in psychiatry, that any attempt to suggest psychiatric treatment to the mother at this time might create greater disturbance in the home. The father felt that the mother was improving under medical treatment. Since the speech correctionist already had established rapport with the child, it was suggested that she provide as many opportunities as possible for the child to be with her in an attempt to counterbalance somewhat the home influence. Consequently, speech lessons were scheduled for several times a week.

At first the writer made an effort to get the child to imitate phrases which fitted into particular environmental situations, but this procedure met with the usual negative reaction. Also, it was thought that the stimulation of another child, who also had delayed though somewhat more fluent speech, might encourage oral response.

Our pupil shrank, however, from all efforts to get her to respond in a joint lesson. In fact, her private session with the speech correctionist following this

experience resulted in her first rejection of the teacher. The child clung to her mother. When her mother left, she ran away and hid in another room. When an attempt was made to bring her back, she kicked, cried and resisted the teacher's attention. However, she recovered from this, and the teacher and pupil spent the rest of the lesson agreeably in play.

The mother reported that the child looked forward to these lessons, and she always evidenced a great deal of pleasure at the coming of the teacher. She was quite demonstrative in her affection. Often the child was too sleepy or tired to put forth much effort. It was several weeks before any success was achieved in getting more than one-syllable words. Eventually, however, she began to say words with the same syllable repeated. Then, she was willing to try other polysyllabic words. She did not always give the correct sound, but at any rate two sounds were put together in one word. Then a few expressions began to show up at home like 'Hurry, hurry,' 'Come here,' 'Bye-Bye,' 'Get down.'

The kindergarten teacher reported about a month later that she seemed occasionally to be carrying on a conversation with the children, but, when the teacher came near, the conversation would stop. The children said she talked with them. She also talked more freely with the Negro janitress, who reported her saying one day, 'Lettie, wait a minute.' One day the child said to her mother while her hair was being combed, 'Don't hurry.' The mother says the child has always hated to have her hair combed and admits that probably she was a bit rough most of the time because of being in a hurry.

Our pupil's first sentences came from playing with alphabet blocks. The teacher would make words from the letters the child picked out. Sentences of two or three words were formed. Then the child was asked to take her turn at saying them after the teacher had told her what they were. This was a slow process. At first word-by-word imitation was all that resulted. However, before the lesson was over she had given one or two word groups. Each lesson resulted in the child's gaining more confidence in her ability to do this. She showed less hesitancy to try what the teacher suggested. She had by this time learned the names of many of the letters. She could count consecutively up to ten. An interesting comment on this counting is that she was counting before she began to try words of more than one syllable, and that she always omitted *seven*. She could not be persuaded to say it. How did she know that *seven* was the only double-syllabled number in that series? She noticeably avoided many words of that kind during this period, showing a canny insight in omitting such words.

She had now come such a long way from her negative attitude toward speech learning that she all but asked her teacher to help her say words. She was willing to try almost anything that was suggested to her in connection with books. Every opportunity was taken now, when she gave a one-word command or answer, to explain that another word or words must go with it to make her meaning clear.

The next problem in the lesson procedure was to break away from books and get a transfer of our pupil's phrases and short sentences to conversation of her own. For she still used her withdrawal technique when more personalized speech was suggested. An incident which occurred at school one day seemed to point the way. She had volunteered to be hostess, and she was asked to select a host to serve with her at the afternoon refreshment period. She mumbled the name softly. When the teacher asked her to say the name louder, she refused, and, when the teacher insisted, withdrew into the cloakroom. The teacher gave her a little 'spanking' and insisted that she say the name loudly enough to be heard. The child seemed startled that the

teacher followed through with her instructions. Then the teacher took her back into the room, where the child shouted the name plainly. She seemed extremely proud of herself and showered the teacher with affection the rest of the afternoon.

The speech correctionist tried the same persistence in the lesson after school, when the child avoided saying something by turning over the page that they were working on. The teacher insisted and our pupil resisted by kicking, squirming, and trying to run away. The teacher remained firm, and the child returned to the task at hand. The lesson continued with pupil and teacher on good terms.

NOW that spring weather is at hand (April, 1945) every opportunity has been taken to have the lesson out-of-doors, and the child has been stimulated to tell about objects that pass or things she can see around her: 'Car goes up hill. Street car goes by. Boy comes. Wind blows. I see two boys. Please come here,' etc. Three words seem to be the best number for her to handle as a sentence, although she will repeat any number word by word. She voluntarily offers many phrases, but, unless her attention is called to it, tends to leave out the verb.

Our pupil has apparently lost her former resistance to speech. She is quite willing to say expressions upon request to anyone, even volunteering to say 'Hello' or some short phrase to a perfect stranger. Her speech is, for the most part, understandable, though she has some consonant substitutions and frequently omits final sounds and word endings. However, she is improving in the mechanics of her speech all the time. She has just begun to correct her own enunciation of a word.

ONE further comment on her behavior at the present time (May 10, 1945). Both her father and the kindergarten teacher report an increased stubbornness and a seeming desire to be 'naughty.' This has also been a factor in recent speech lessons. Probably this is just another release from her former repression and withdrawal, which should be interpreted as a healthy sign of development.

It is the belief of the writer that the child is now ready, willing and has the *ability* to continue her progress toward normal speech, though her success in doing this will depend upon careful handling to crystallize her speech development into an habitual response and to prevent her former behavior pattern.[1]

[1]Since this article has been written, the mother has been persuaded by a former school mate of hers to visit a psychiatrist. The child has been scheduled for tests in the same clinic. It had been suggested by the writer in a conference with the father in April that the child should be given a change of environment away from the home during the summer months. The visiting teacher will work with the personnel of the psychiatric clinic to secure the most suitable placing of the child, guided by her showing on the proposed tests.

JOURNAL OF SPEECH DISORDERS, 1945, **10**, 335-343

Stuttering In Twin Types

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CERTAINLY the kind of research involved in the study of the possible hereditability of dysphemia is not tailor-made; indeed, were it not for the element of surprise and intellectual curiosity, this type of investigation would often approach drudgery. Data, in order to be as reliable as is humanly possible, must be secured by means of direct examination of the stutterers and their parents, which necessitates home calls; too many cases have to be discarded, after hours of work, because of incomplete details; and lastly, the stuttering potential is not always revealed as are eye color, hair form, or general physical structure. As in heredity studies in carcinoma, tuberculosis, epilepsy and other diseases, one can speak only in terms of bodily predisposition.

HISTORY

THIS research was prompted by the results of several studies investigating the hereditability of a dysphemic condition by the pedigree method. Wepman (**59**) found that stutterers showed familial stuttering tendencies in a high percentage of his cases. Nelson (**32**), in 1938, found certain tendencies which, if linked together, might point to a possible hereditary factor in dysphemia. Briefly, she found: (1) That stutterers tended to belong to pedigrees showing stuttering members. (2) That stutterers, both male and female, came from pedigrees showing a significantly greater percentage of stutterers of the same sex as that of the stutterer. (3) That a significantly greater percentage of stutterers showing stuttering in the ancestry began to stutter at the onset of speech[1] while those showing no stuttering in the ancestry were most likely to stutter after the onset of speech and most often after apparent precipitating factors that were more severe as well as more numerous than those noted among the stutterers with stuttering ancestry. (4) That the association factor was slight, inasmuch as an almost equal percentage of stutterers and non-stutterers had associated with other stutterers, and furthermore, 375 non-stuttering sibs had been closely associated with stuttering brothers and sisters. Nelson was unable to establish a sex-linked hereditability, even though the tendency was noted. About the same time Palmer and Gillett (**40**), in a study of sex differences in cardiac rhythms of stutterers, stated the opinion that 'the cause of stuttering must be sought in a sex-linked metabolic picture.'

At the beginning of the present

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[1]'Onset of speech' refers to the first year of speech, and not to the first word babbled or spoken. Nelson's tables show that 11 stuttering children were reported to have started to stutter *when learning to talk* between the ages of 1 and 2, 64 between the ages of 2 and 3, 5 between the ages of 3 and 4, 2 between the ages of 4 and 5 and 1 between the ages of 5 and 6.

study, there was no known research in which possible heritable dysphemic factors had been examined by means of a comparative study of monozygotic (identical) and dizygotic (fraternal) twins, or by a comparison of the members of an identical pair. Twin research had been conducted in the study of various conditions and problems, such as deafness, teeth and jaw malformations, mongolism, early and deferred vocabulary training, structure of the tympanic membrane and mental development (see Bibliography). In the field of speech, even though speech correctionists had been confronted with cases of idioglossia, stuttering, and other speech defects among twin pairs, no research had been conducted to determine the biologic significance of speech disorders among twin types.

Impetus for such a study was given by Berry (**3**) who, in making a survey of the medical records of 500 stutterers in Chicago hospitals, discovered a 'preponderance' of twins among stuttering families. In a later study (**4**) in 1938, Berry revealed that the incidence of stuttering was greater in twinning than in non-twinning families. From these studies she postulated a 'common denominator for twinning, stuttering and sinistrality in genic forces.' Berry, however, did not attempt to evaluate the incidence of stuttering among twin types, that is, monozygotic and dizygotic twins.

Francis Galton (**20**), in 1876, recognized the existence of twin types. He believed that monozygotic or identical twins had a common heredity and that dizygotic or fraternal twins were no more closely related than single siblings. Galton was also convinced that when a quality or idiosyncrasy was found to be present consistently in both members of the monozygotic pairs, and was observed in only one member of each dizygotic pair, the factor might be considered hereditary. On the other hand, if the factor was often observed to be present in both members of the dizygotic pairs as well as in both members of the monozygotic pairs, it might be regarded as due to environmental circumstances (**20**, 155-173). If one is to recognize this universally accepted belief of such biologists and embryologists as Komai (**27**), Newman (**37**), Wilder (**63**), Lauterbach (**28**), and Greulich (**22**), namely, that twin members of a monozygotic pair are identical in heredity and twin members of each dizygotic pair are hereditarily different, or related only as siblings, then one cannot work on the principle that all twin phenomena are similar but must account for the difference in heredity among the one-egg (identical or monozygotic) and the two-egg (fraternal or dizygotic) pairs. Newman (**37**, 122) agrees with Galton, stating that since each pair of monozygotic twins is identical in heredity and each pair of dizygotic twins is hereditarily different, it would be safe to conclude that 'all characters that are invariably alike in one-egg pairs are definitely hereditary, and that characters in which one-egg pairs differ as much as do two-egg pairs are not truly hereditary but are due to differences in environments, especially those encountered before birth.' He continues, 'When a pair of twins both possess the same peculiarity, it is said to be concordant, but when only one member is affected, it is said to be discordant.' Studies identifying twin type by means of the concordance-discordance method have been conducted on such factors as eye color, freckle pattern, blood type, onset and severity of children's diseases, feeble-mindedness and mongolism (see Bibliography).

It should also be mentioned that Greulich (**22**, 414), believes that there is not a 'hereditary predisposition for twinning among parents of monozygotic twins,' but that the 'capacity to produce dizygotic twins is hereditary.' Newman (**37**, 75) concurs, saying that 'there are evidences that the tendency for two-egg twinning has a

hereditary basis,' while 'one-egg twinning must be a matter of pure accident or else due to some unknown environmental factors.'

The fact that biologists accept two different classifications of human twins, and the knowledge that the concordance-discordance method is applicable to the study of a heritable factor among twin types, led Hunter and Walter (junior authors of this paper) to investigate the incidence of stuttering among identical and fraternal twin pairs, in order to note any possible biologic dysphemic tendency as suggested in Nelson's study. Interest was further aroused by Seemann's (**50**) article, 'The Significance of Twin Pathology for the Study of Speech Disorders.' Seemann, while directing a speech clinic in Berlin for six years, was able to study both members of 39 pairs out of a possible 129 twin pairs brought to his clinic. He classified 25 pairs as fraternal and 14 as identical. Among the 25 fraternal pairs, 5 pairs showed stuttering within the twin pair, but only one member stuttered in each of the 5 pairs (3 pairs were of opposite sex and 2 pairs were of the same sex). Among 14 identical pairs, 2 twin pairs showed stuttering and both members of each pair stuttered.

PROCEDURE

HUNTER and Walter accumulated data on 200 twin pairs. Hunter made the first study with 100 pairs, classifying twin type by the instantaneous identification method; Walter continued the following year with a study of 100 pairs, using instantaneous identification and dermatoglyphical methods for classification of twin type. Hunter found her twin subjects in central and northern Illinois; Walter conducted her survey in southern Illinois, northwestern Kentucky and northern Missouri.

General methods of examination were similar. Home calls were made; parents were consulted; sometimes teachers and attending physicians were interviewed; and *always* both members of each twin pair were thoroughly examined for similarities and speech habits. When for some reason, only one twin member could be examined, the data sheet was discarded. Ages ranged from four to forty years.

The first step in each study was to establish criteria for distinguishing monozygocity of twin pairs. This part of the study was most exacting because the investigators realized that the results depended solely on how carefully the twin types were classified. Biologists have determined monozygocity of twin pairs by various methods: pre-natal and post-natal examination, physiognomy and instantaneous identification, chemical analysis, dermatoglyphical analysis, and symmetry reversal. Newman (**37**, 87) expresses an opinion that it is possible to classify twin types according to instantaneous identification, that is, by comparison of certain observable features such as coloring and structure, with a very small fraction of error. Hunter, for this reason, established validity of twin type by this method, including similarity in hair color and texture, in skin color and texture, in eye color and iris pattern, in fingernail and hand formation, in ear form and in teeth structure. Walter decided to continue Hunter's study in classifying twin types first by instantaneous identification and second by the dermatoglyphical method, thus using subjective and objective methods of classification. At the time of the interview with parents, Walter typed the twin pair by instantaneous identification which included the same general criteria as were used in Hunter's study. She then finger-printed both members of the twin pair for later dermatoglyphical study.

In the last twenty years, special emphasis has been placed on the use of dermatoglyphical analysis in twin studies by Wilder (**63**), Newman (**38**), Bonnevie (**6**), Cummins (**13**), Komai (**27**) and MacArthur (**30**). Like blood type, coloring and struc-

ture, the friction ridge patterns of the fingers, palms and soles of the feet are heritable factors. MacArthur (**30**) writes, 'Similarity methods work on the principle that parents will ordinarily be heterozygous for some of the many factors involved, and the possible combinations resulting from segregation and fertilization will be so numerous that children developing from separate eggs will seldom fail to differ in some of the digital characters, while a really close resemblance amounting to concordance in all or most of these characters will be expected only when the genotype is duplicated as in identical twins.'

In dermatoglyphical analysis, concordance of quantitative and qualitative features of the prints serves as proof of monozygocity. The quantitative features involve the character of the ridge patterns. Since it is acknowledged that friction ridges can be recognized as early as the fourth month of intra-uterine life and remain invariable throughout a person's life-time, Walter decided on a study of digital prints. The papillary patterns used in this study were loops, whorls and arches with their variations. Modifications and combinations were incorporated under one of the three patterns, with symbols similar to those used by Wilder (**63**). The ten digital prints of each twin were thus classified according to print type. Homologous prints of twins A and B of a pair were then compared. Monozygocity of twin pairs was established through dermatoglyphical analysis if one or more of the following features was present in the friction ridge patterns:

1. Concordance of seven or more homologous digital prints.
2. Close resemblance in both pairs of hands as to general type of print.
3. Presence of a unique print in the prints of each twin.
4. Closer resemblance homolaterally than bilaterally.
5. Closer resemblance heterolaterally than bilaterally.
6. Symmetry reversal in one or more prints, accompanied by concordance of five or more prints.

RESULTS AND INTERPRETATION

RESULTS of the instantaneous and dermatoglyphical classifications were then compared by Walter. In four cases of disagreement, the dermatoglyphical analysis was finally used to establish twin origin.

The statistical results as to incidence of stuttering among twin pairs were combined from the two studies in order that conclusions could be governed by a sampling of 200 twin pairs. It should be said here that Walter's study corroborated results found in Hunter's research.

It was considered to be more correct statistically to tabulate according to number of pairs showing incidence of stuttering rather than according to the number of individuals, because monozygotes of one twin pair have one identity, whereas dizygotic members are related only as siblings. However, differences among individuals will be pointed out in several instances.

The results were as follows:

1. Of these 200 twin pairs, 78 were opposite sexed, which immediately established their dizygocity. The remaining 122 same-sexed pairs were examined by the methods mentioned earlier. Of the 122 same-sexed pairs, 69 pairs were classified as monozygotics or identical; 53 pairs were identified as dizygotic or fraternal. Thus, of the total 200 twin pairs, 69 pairs, or 34.5 per cent, were found to be identical, and 131 pairs, or 65.5 per cent, were found to be fraternal. This ratio deviates slightly from the accepted one cited by scientists. Newman (**36**) states that 25 per cent of human twins are identical; Guttmacher (**23**) believes 'about 70% of all twinning pairs are of the 2-egg variety and 30% of the 1-egg variety.' Berry (**4**) found in her study that 'according to parents' reports, 65.5% of the twins were fraternal, 32.8% identical.'

2. (a) Stuttering was found among 30, or 22.7 per cent of the fraternal or dizygotic twin pairs; and among 10, or

TABLE 1. Classification of 200 Pairs of Twins.

Case No.	*Study I Type*	*St.*	*Study II Type*	*St.*	*Case No.*	*Study I Type*	*St.*	*Study II Type*	*St.*
1.	M		DO		51.	DS		DO	
2.	DS		DO		52.	M		DS	m
3.	M		DS		53.	M		M	
4.	M		DO	m	54.	DO		M	mm
5.	M	ff	DO		55.	M		M	
6.	M		DS	f	56.	DO		DS	
7.	M		M		57.	M	ff	M	mm
8.	M		DS		58.	DO	f	DO	
9.	DS		DS		59.	DS		DO	
10.	M		DS		60.	DO		DO	
11.	M		DO		61.	M		DO	m
12.	M		DS	m	62.	DS	mm*	DO	
13.	M		DS		63.	DO		DO	m
14.	DO		DS		64.	DS		DS	mm*
15.	DO		M	mm	65.	DS		DS	f
16.	M		M		66.	M		DS	
17.	DS		DS		67.	DO		M	
18.	DS		DS		68.	M		M	
19.	M		DS		69.	M		M	
20.	DS	m	M		70.	M		M	
21.	DS		DS	m	71.	M		M	
22.	DS		DO	m	72.	DO		M	
23.	M		DO		73.	M		DO	
24.	DS		M		74.	DO		DS	f
25.	DO		M		75.	DO		DO	
26.	DS		M		76.	M		DO	m
27.	DO		M		77.	DO		DO	
28.	M		M	mm	78.	DO		DS	
29.	M		DO	f	79.	DS	f	M	m*
30.	DO		DS		80.	DS		DO	m]
31.	M		DO		81.	DO		DO	f
32.	DO	f	DO	f	82.	DO		DO	
33.	M		DS		83.	DO		M	
34.	DS		DS		84.	DO	m	DS	
35.	DO		DO		85.	DO		DO	
36.	DO		DO		86.	DO		M	
37.	DO		DS	m	87.	DO	m	DO	
38.	DO		DS		88.	DO		M	
39.	DO		DO		89.	DS		DO	
40.	M		M		90.	M		M	ff
41.	M		DS	f	91.	DS	m	M	ff
42.	DO		DO		92.	M		DS	m
43.	M		DO		93.	DS	f	DS	m
44.	DO		DO		94.	DO		DS	
45.	M		DO		95.	DO		M	
46.	DS		M		96.	DO		DO	
47.	M		M		97.	DO		DO	
48.	DO		DO		98.	DO		DS	
49.	DO		DO	m	99.	M		DS	
50.	M		DS		100.	DO		M	

M—Monozygotic
DS—Dizygotic—same sex
DO—Dizygotic—opposite sex

m —stuttering male
f —stuttering female
* —exception to other cases.

14.4 per cent of the identical or monozygotic twin pairs; or among 20 per cent of the total 200 twin pairs. Thus, if one tabulates according to the number of pairs showing stuttering within the twin pairs, one finds stuttering occurring in a significantly greater percentage of dizygotic twin pairs than of monozygotic pairs. Whether this incidence can be correlated with the fact that dizygotic twinning is thought to be heritable cannot be decided at this time, but the tendency will be noted later in Walter's tabulation of twin pairs (see Table 1). If, on the other hand, one records according to the number of individuals, one will find a greater percentage of monozygotes stuttering than dizygotes: 13.7 per cent of 138 monozygotes stuttered, 6.4 per cent of 262 dizygotes stuttered.

(b) Sex distribution was as follows: among the 10 stuttering identical pairs there were 8 female stutterers and 11 male stutterers; among the 30 stuttering fraternal pairs there were 21 male stutterers and 11 female stutterers.

3. When stuttering occurred among dizygotic twin pairs, only one member stuttered in all cases, with two exceptions; when stuttering occurred among monozygotic twin pairs, both members stuttered in all cases, with one exception, which fact accounts for the greater number of stuttering monozygotes. There would seem to be established, then, a concordance for stuttering phenomena in dizygotic twinning among these twin pairs. Since monozygotic twins have a one-egg origin and thus are chromosomatically identical, and since dizygotic twins have a two-egg origin and are consequently related only as siblings, one would expect, if there is an hereditary factor which accounts for dysphemia, to find, as in other heritable characters, a concordance for stuttering among members of monozygotic twin pairs and a discordance for stuttering among members of dizygotic twin members. Data from these two studies substantiate that supposition.

4. After finding that Hunter's study seemed to confirm the tendency of hereditability of a dysphemic condition, as shown in Nelson's study, Walter decided, in addition to classifying according to the dermatoglyphical method, to study also apparent stuttering and twinning strains. Her data, due to a small sampling of stutterers, can only show trends and need further confirmation:

(a) Fifteen pairs, or 24.5 per cent of her 61 fraternal twin pairs showed familial incidence of stuttering; of these 15 pairs, 9 pairs revealed possible stuttering strains through three generations. The remaining 6 pairs, 2 female-female, 2 male-male, and 2 opposite sexed, showed stuttering in one generation. Among the identical twins, 8 pairs of the 39 pairs, 20.5 per cent, showed familial incidence of stuttering; of these 8 pairs, 2 female-female pairs revealed possible stuttering strains in the generation of the stuttering subjects and of the parents. The 6 remaining pairs, 3 male-male and 3 female-female, showed stuttering within one generation only. An examination of Table 2 showing these tendencies will indicate how noticeable the stuttering strains are among the fraternal twin ancestry compared with the very slight tendency among the ancestry of the identical twins.

(b) The same tendency was noted in twinning strains. Nine pairs of the 15 fraternal pairs showing familial incidence of stuttering revealed fraternal twinning strains within three generations. Six of these 9 pairs which revealed possible twinning strains also showed apparent stuttering strains. Among the identical twin pairs showing familial incidence of stuttering, no known identical twinning strains were shown.

5. Walter also found that both monozygotes and dizygotes of her stuttering pairs began to stutter during the first year of speech, with the ex-

TABLE 2. Possible stuttering strains in parental and grandparental generations of monozygotic and dizygotic twins.

Monzygotic Twins

	Stuttering in generation of				
	Siblings		*Parents*		*Grandparents*
Case No.	*Twins*	*Sibs*	*Pat. S.*	*Mat. S.*	*Pat. S.* *Mat. S.*
5—F	FF	M	Father		
57—F	FF			Mother	

Dizygotic Twins

	Stuttering in generation of							
	Siblings				*Parents*		*Grandparents*	
Case No.	*Opp. Sex*	*Same Sex*	*Twins*	*Sibs*	*Pat. S.*	*Mat. S.*	*Pat. S.*	*Mat. S.*
32.	X		F	M		Mother	Gfather	
42.	X				Father		Gfather	
58.	X		F		M Sib		M&F Sib	
					Father			
62.		M	MM			M Tw		
75.	X			M				F Sib
84.	X		M				Gfather	
87.	X		M			M Sib	2 M Sibs	M Sib
91.		M	M	2M		M Sib	M Sib	
97.		M			Father		Gfather	

F —Female
M—Male
X —Opposite sex

Mat. S.—Maternal Side
Pat. S.—Paternal Side

ception of one dizygote who began to stutter at the age of 3 years after a severe back injury.

CONCLUSIONS

1. Stuttering was found among 14.4 per cent of the monozygotic twin pairs and among 22.7 per cent of the dizygotic twin pairs, a ratio of 2 to 3.

2. A concordance for stuttering phenomena was shown among monozygotic twin members and a discordance for stuttering phenomena among dizygotic twin members.

3. The concordance - discordance method which has been used by previous investigators to study heritable factors among twins should prove an excellent method for further studies in dysphemia. If, as Greulich and Newman suggest, there is not an 'hereditary predisposition among monozygotic twins for twin births,' but that the 'capacity to produce dizygotic twins is hereditary,' then it should prove of value to investigate other tendencies noted but not ascertained because of insufficient sampling, namely: (a) the incidence of twinning strains as shown in the ancestry of stuttering and non-stuttering pairs of each twin type; (b) the correlation between apparent twinning and stuttering strains in the ancestry of pairs of each twin type.

4. Finally, the question, which may have arisen for the readers, as to whether the concordance for stuttering phenomena is a matter of germ plasm or of social and environmental factors, should be answered by further study. Can this dysphemic condition be considered a physical disability such as defective vision, club feet and other

crippling conditions, or do monozygotic twin members have a 'telepathic' identity so that when one member stutters, the other member stutters in order to keep their identity or individuality as twin monozygotes? The fact that fraternal twin pairs seem to show a discordance is part of the answer; the fact that the majority of stutterers showing stuttering in the ancestry begin to stutter at the onset of speech, as shown by Nelson and Walter, is also important in relation to final conclusions. The rest of the answer lies in the results of the above suggested tendencies which have been noted but not ascertained.

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Abstracts of Current Articles

Mary Huber, Editor*

ALTMANN, FRANZ. Dizziness of peripheral vestibular origin. *Laryngoscope,* 1945, **55**, 164-173.

Labyrinthine vertigo is usually a typical turning vertigo which is accompanied by the sensation of pseudo-movements; it is associated with nausea and frequently terminates in vomiting and with general vaso-motor symptoms such as pallor and cold sweat; it is accompanied by nystagmus and as a rule, but not necessarily, is preceded by, or combined with hearing disturbances.

Certain cases show a triad of symptoms consisting of repeated attacks of labyrinthine dizziness, reduced hearing and, in most instances, tinnitus without any active disease of the middle ear and without any medical or neurological abnormalities. The intervals between the attacks are of various length. During these periods the vestibular symptoms usually disappear completely; but reduced hearing and frequently the tinnitus persist. The dizziness disappears eventually in many instances, but the hearing loss is progressive and may even lead to complete deafness.

Clinical evidence leads many authorities to believe that the attacks are the result of circulatory disturbances in the labyrinthine vessels which cause an over-production of endolymph with an increase of endolymphathic pressure. Furthermore, the vestibular symptoms are due to an imbalance resulting from a dominance of the healthy or less affected labyrinth. As a rule the side of the more affected labyrinth shows the greater hearing loss but there are exceptions to this rule.

Apparently there is no particular type of hearing loss characterizing Meniere's disease, for in some cases the involvement of the entire tone range is found, or the hearing loss may become very marked. Frequently intermittent diplacusis binauralis dysharmonica is found.

Regardless of what the final explanation of the clinical picture may be, there is a tendency of the disease toward spontaneous remissions, which sometimes last years, and which must be remembered when one attempts to evaluate the use of certain therapeutic measures in treating this condition. *(Alice Mendenhall, Minnesota.)*

BARTLEY, H. S., and CHUTE, E. A preliminary clarification of the concept of fatigue. *Psychol. Rev.,* 1945, **52**, 169-175.

A description of fatigue and its relationships to work output and physical impairment is given to provide a clearer understanding of the word *fatigue.* This clarification of the meaning of *fatigue* should also be of use in the directing of future research. *(Betty L. Nesom, Louisiana.)*

BIJOU, S. W., and WERNER, H. Language analysis of brain-injured and non-brain-injured mentally deficient children. *J. Genet. Psychol.,* 1945, **66**, 239-235.

In a series of studies, most of them involving some type of sorting technique, mentally retarded brain-injured children have been shown to be impaired in the formation of conceptual relationships and in the ability to classify objects with reference to life and consciousness. Nineteen non-brain-injured and nineteen brain-injured mentally deficient children, matched as to Stanford-Binet M.A. and I.Q. were given specially constructed vocabulary tests to find out whether the difficulty was concept formation *per se* or the result of the physiological condition.

The results showed that the brain-injured were superior to the non-brain-injured by (1) greater range of words correctly defined, (2) qualitative superiority of definitions, (3) employment of more advanced modes of expression, (4) more detailed and complete meanings.

The authors believe that the above results point to pathological dynamism as the cause of poor concept formation because what Goldstein terms impairment of the abstract attitude would interfere with verbal response as well as concept formation.

It is also to be noted that the more critical the attitude of the brain-injured patient the better the answer. *(Tamara Pollack, Northwestern.)*

DAVISON, F. W. Otolaryngologic symptoms of the psychoneuroses. *Laryngoscope,* 1945, **55**, 52-61.

The author describes the complaints of 100 patients who consulted the otolaryngologic clinic, 11 of whom were cases of cardiospasm. All 100 patients had other neurotic complaints in addition to those for which they came to the clinic. He warns against a local treatment of symptoms which are psychogenic, and recommends at least an elementary knowledge of up-to-

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date psychiatry and of the principles of psychosomatic medicine for every otolaryngologist. *(Katherine Thorne, Minnesota.)*

DESPERT, J. LOUISE. The resistance to change in the adolescent girl. *The Nervous Child,* 1944-1945, **4**, 8-16.

During adolescence, owing to increased biological and psychological pressure, increased problems of adjustment appear. When a problem is present, the resistance to change observed in certain adolescent girls serves as a basis for the selection of therapeutic methods, a judgment of the chance of recovery, and an evaluation of personality adjustment.

The author presents five cases which show the factors involved in the resistance to change in these five girls. The cases varied as to problems, background, symptoms, and progress. However, the author found certain similarities, namely: there was a tendency in all cases to cling to early behavior patterns, there was hostility toward the mother, there was a lack of interest in boys, and a tendency to unusual homosexual attachment. The mothers who had emotional and marital frustrations projected those frustrations upon their children; as a result, the mothers put excessive demands on the girls' achievement, and this pressure to accelerate maturation seemed to create an urge of resistance which, in turn, caused emotional and intellectual inhibition.

In conclusion, the author states that at the time of adolescence the girl's identification with her mother is necessary for normal sexual adjustment. Therapy must affect the resistance to change if emotional growth is to surge forward rapidly at the time of adolescence. *(Geraldine K. Fergen, Louisiana.)*

HAYAKAWA, S. I. General Semantics: An introductory lecture. *Etc.: A Review of General Semantics,* Spring, 1945, **2**, 160-169.

This article is devoted chiefly to definitions of General Semantics. The author defines it first: 'General Semantics is the study of human *responses* to symbols, signs, symbol-systems (including language), sign systems, and sign situations.' The author says that the 'meaning of words' in General Semantics does not deal with the generally accepted idea that all words *can* be explained with more words.

General Semantics is further defined as 'the study of identifications and how to reduce their number, in the interests of the greater efficiency of our evaluations.' Identification, defined by Korzybski and Hayakawa, is a 'a general term describing all cases of sematic mal-functioning' and is 'an internal thing.'

A final definition is: 'General Semantics is an educational theory whose aim is to study the evaluational processes of human beings, comparing and contrasting the evaluational processes . . . and then on the basis of these comparisons, finding the places at which pathological identifications occur and striving to eliminate them.' *(Betty L. Nesom, Louisiana.)*

HILL, H. An interbehavioral analysis of several aspects of stutterers. *J. gen. Psychol.,* 1945, **32**, 289-316.

This author deals with the organismic approach in the field of stuttering. In therapy, this approach may be employed since the organism and its behavior are available for treatment. The discussion deals mainly with affective and emotional factors of speech behavior, affective responses being considered chiefly internal or visceral responses, and emotions as states of the organism which are aroused by objects and conditions in the environment of the individual. In conclusion, the author emphasizes the fact that we must look upon stuttering as a complex of psychological phenomena and not as one form. *(Agnes Burris, Louisiana.)*

KASSER, E. The growth and decline of a children's slang vocabulary at Moosehart, a self-contained community. *J. genet. Psychol.,* 1945, **66**, 129-137.

The author defines slang as the use of old words having unauthorized meanings, and the use of new words originated to fill in the gaps in vocabulary. His purpose is to follow up a previous study by Merryweather of the permanency of the slang vocabulary of the children of the Moosehart community over a period of eleven years.

The author found 78 slang words in the present study, 60 of which were not found in the previous study. Eighteen (23 per cent) were included in the earlier study, and ten of these (13 per cent) are now in general usage, leaving eight specific local slang words that have survived for the eleven-year period. A list of these, with definitions, as well as a list of the words collected in the author's study are presented. *(Geraldine Fergen, Louisiana.)*

KERCHENFAUT, LOIS C. Mental testing of the deaf. Unpublished Master's Thesis, Univ. Illinois, 1945.

The problem of this study was to trace the history of mental testing of the deaf and by means of a survey, to determine what mental tests are being administered in the schools for the deaf at the present time. A questionnaire was sent to forty of the larger schools for the deaf requesting the following information: (1) the names of mental tests administered; (2) variations from original test procedures; (3) special considerations given in testing the deaf; (4) comments regarding problems involved in testing the deaf; (5) interpretation of final test scores and provisions made in curriculum to develop child's potentialities to the fullest extent.

A total of 24 mental tests is mentioned in the replies. The selection of mental tests, and number and tests used, vary with schools. Some schools are giving no mental tests because the tests are considered inadequate; some are not routinely testing; others are not testing because they have no one qualified to administer tests; still other schools confuse the term 'mental tests' with achievement tests.

The Pintner Non-Language test is administered in several schools; the Otis and Chicago Non-Verbal tests are used in six schools; the Pintner-Paterson Performance Scale and the Grace Arthur Point Scale are administered in five schools; the Ontario School Abilities Examination is given in four schools; 18 other tests are administered in one or two schools.

Fourteen of the 24 mental tests mentioned are classified as non-verbal, five as verbal, two as unknown, and three as combinations of both.

Six schools are using variations from regular test procedures; six are not using variations; eight do not answer the question. Seven schools give no special consideration when testing the deaf; nine schools give no answer and seven schools were specific about the problem. Eighteen schools comment in regard to the problems involved in testing the deaf. Three schools made no reply in regard to how the final test scores are used. Replies from the other schools are varied.

The survey seems to indicate a need for uniformity of opinion in regard to which mental tests should be used in testing the deaf. It also indicates a need for more trained personnel who have a knowledge of psychology as well as the problems and limitations inherent in the deaf. This responsibility would either have to be taken by psychologists trained in deaf education or by educators of the deaf who have been trained in psychology and psychometry. *(Severina E. Nelson, Illinois.)*

LASSERS, L. The organization of the speech improvement and correction program in Oregon. *Quart. J. Speech,* 1945, **31**, 207-214.

In the chiefly rural state of Oregon a survey of existing problems and conditions, in connection with the state-wide program for the education of handicapped children, brought to light some problems in speech rehabilitation encountered in many elementary schools.

The classroom teacher's lack of training in speech is the biggest problem encountered by the author. The conscientious classroom teacher is unable to help speech handicapped children, since she lacks both time and training. Speech training in the elementary schools is inadequate. The author advocates requirement of more courses in speech before granting degrees to teachers, as well as the use of many demonstrations in courses dealing with speech problems of children.

At least fifteen minutes daily should be devoted to speech as a special subject. The special teacher, when and if there is one, is usually overloaded. Often the classroom teacher may take no further interest in the problem. The drills given the child by the special teacher are of little value unless the therapeutic measures are furthered by the classroom teacher. *(Betty L. Nesom, Louisiana.)*

LINN, LOUIS, and STEIN, MARTIN. Psychiatric study of blast injuries of the ear. *War Medicine,* 1945, **8**, 32-33.

In this study the A group consisted of 40 patients who showed objective evidence of traumatic rupture of one or both drums. In every case there had been loss of consciousness at the time of the injury, and in none of the cases were there any disabling psychiatric complications.

The B group consisted of 40 psychiatric battle casualties, the onset of the neurotic symptoms being associated with proximity to blast. Of those patients who complained of impairment of hearing as part of the neurotic symptom complex, not one had a ruptured ear.

The authors conclude that the psychiatric complications are a result of a loss of consciousness which is an emotionally determined syncope rather than complete amnesia. *(Tamara Pollack, Northwestern.)*

MOWRER, O. H. and ULLMAN, A. D. Time as a determinant in integrated learning. *Psychol. Rev.,* 1945, **3**, 61-90.

The authors feel that each of three contemporary schools of psychology, i.e., Gestalt, objective and psychoanalytic, has made definite contributions to the better understanding of integrated functioning of living organisms. Each has fostered much research and many studies concerning the learning processes. It is still true, the authors observe, that organisms often behave in a non-integrative way, and this behavior is the outstanding characteristic of neurosis and criminality. The authors feel that time is a factor of special significance in non-integrative behavior and that it should be taken into account in attempting a satisfactory solution.

In conducting their study, the authors evaluated a great deal of earlier research before setting up their experiment with 21 rats which were put through a maze-type test. As a result of the experiment, the authors concluded that a given action is influenced by timing. They deduce that rational behavior is influenced by timing and that the time element is important in integrating behavior. They further conclude that neurotic and criminal behavior is on the pre-rational, or animal, level of func-

tioning and that psychosis is due to an over-elaboration of rational processes.

The article is well annotated, having 90 references. *(Geraldine Fergen, Louisiana.)*

PEACHER, W. G. Speech disorders in World War II: further studies. *J. nerv. ment. Dis.*, 1945, **102**, 165-171.

A survey of speech disorders conducted at Brooks General Hospital from May 1943 to January 1945 revealed 217 cases, 18 per cent of which followed wounds or exposure to modern warfare. The classification of type of disorder showed patients exhibiting dysarthria, dysphemia (stuttering), dysphasia, dysphonia, and dyslalia. The author states that speech therapy has been of value in many cases of this type, and should be included during the various phases of rehabilitation. *(Katherine Thorne, Minnesota.)*

NEW, MARY C. Speech suggestions for the hard of hearing. *Hearing News*, 1945, **3**, 2-4.

Although deterioration of speech and voice is one of the major problems of a hearing loss, the author maintains that such need not occur if the deafened person is aware of the problem, if he will accept constructive criticism regarding his speech from his family and friends, if he will wear a hearing aid and utilize whatever hearing is present, and if he will establish an 'inner control' over his voice by stressing tactile and kinesthetic sensation in the production of sounds. *(Rhoda Sutta, Halloran General Hospital.)*

PERLMAN, H. B. Physics of the conduction apparatus. *Laryngoscope*, 1945, **55**, 337-348.

Some of the physical properties of the human conducting mechanism were determined on fresh temporal bone. Studies along these lines can help the otologist to understand how the normal conducting mechanism functions as an acoustic instrument and the particular manner of its response to sound waves. The significance of these properties in determining the response of the middle ear structures to sound waves is pointed out. *(Arthur Secord, Brooklyn.)*

POWERS, SISTER MARY ROSE. Personality traits of junior high school stutterers as measured by the California Test of Personality. Unpublished Master's Thesis, Univ. Illinois, 1944.

The problem of this study was to measure the personality traits of Junior high school children, stutterers and non-stutterers, in order to compare the adjustment of both groups. In self-adjustment there is no significant difference shown between stutterers and non-stutterers. In social adjustment there is a tendency toward a significant difference between stutterers and non-stutterers. In total adjustment there is no significant difference, so it may be justly said that stutterers and non-stutterers in junior high school tend to be equally well adjusted. *(Severina E. Nelson, Illinois.)*

PREU, PAUL W. Fatigue and rest in nervous disorders. *Hygeia*, 1945, **5**, 342, 343 and 390.

Because one-fifth of all illnesses are nervous in origin, the author feels that it is important to discuss the cause of nervousness. Most patients suffering from nervous illnesses complain of fatigue. There are four kinds of fatigue which must be distinguished before treatment can be recommended. The first is muscular soreness and stiffness and usually responds to rest, heat and massage. Muscular fatigue is not often caused by disorder of the nervous system, although occasionally there is a relationship. Myasthenia is a rare disease of this order and progressive muscular atrophy falls in this classification.

General weakness is the second type of fatigue and is characterized by breathlessness and palpitation. It may be associated with many diseases, but seems to have little relation to nervous illnesses; its cure lies in the cure of the disease, proper nutrition and resumption of normal activity. While general weakness is not caused by a disorder of the nervous system, it is sometimes a symptom of anxiety which is a common nervous disorder. In this case prolonged rest is not advised, but rather a solution of the patient's problems and worries which will quiet the emotional disturbance and rout the fatigue is prescribed.

The third type of fatigue is caused by lack of sleep and unless kept awake by pain the patient will sleep when sufficiently fatigued. Sleeplessness is common in two types of nervous illness, anxiety and depression. The treatment of depression is the same as that of boredom, discontent, and disinterest. These latter factors cause the fourth type of fatigue. Depression and melancholia are serious nervous disorders; the last two types of fatigue can be symptoms of these illnesses. Often these illnesses require hospitalization, stimulating drugs, and electric shock. Vacation, change, rest and mild activity will often cure cases which are not severe. *(Geraldine Fergen, Louisiana.)*

ROSE, ANNELIES ARGELANDER. Insecurity feelings in adolescent girls. *The Nervous Child*, 1944, **4**, 46-59.

This study of insecurity feelings in adolescent girls was based on autobiographical reports of students at Smith College enrolled in a course in the psychology of adolescence.

The period of development covered in this study and questionnaire was limited to the period between the ages of 12 and 17 years inclusive. The Thurston Personality

Schedule and the Bell Adjustment Inventory were used.

For evaluational purposes, three types of difficulties experienced by girls in making social adjustments formed the basis for this study: ability to make friends, ability to cooperate with others in group activity, and ability to adjust socially to members of the opposite sex.

It was found that developmental and environmental factors tended to explain the insecurity of the girls. *(Betty L. Nesom, Louisiana.)*

ROSENZWEIG, S., ROOT, Q. T., and PEARSON, G. B. Education for clinical psychology. *J. consult. Psychol.*, 1944, **8**, 354-359.

The program of training at the Western State Psychiatric Hospital, affiliated with the University of Pittsburg, includes a junior internship which leads usually to a master of science degree from the university and a senior internship which leads usually to the degree of doctor of philosophy.

The three major phases of the internship include clinical experience, university courses, and participation in research. *(Betty L. Nesom, Louisiana.)*

SINCLAIR, J. G., and MCKAY, J. Median harelip, cleft palate, and glossal agenesis. *Anatom. Rec.*, 1945, **91**, 155-160.

This is a report on a combination of congenital defects found in a 4 weeks-old infant who had died of diagnosed causes. The defects included median harelip, cleft palate, undeveloped tongue and palatal primordia, small heart and short digits, united by webs.

The possibility of genetic causes is discussed. The writers agree that certain skeletal phenomena are the outward evidences of syndromes, the more significant of which are never seen or studied. *(Helen I. Seip, Louisiana.)*

SWENGEL, BEULAH W. Audiometric analysis of hard of hearing children as related to the problem of retardation. Unpublished Master's Thesis, Univ. Illinois, 1944.

The problem of this study was to determine the relationship of hearing loss and educational retardation. The number of years of educational retardation was determined for those who had a hearing loss of 10 decibels or more. There was an average retardation of .93 years per child. Those children who did not have an average hearing loss of 10 decibels in either ear had an average retardation of .33 years per child. The correlation between the hearing loss and I.Q. is .61 which is positive but not significant. The correlation between the hearing loss and retardation is .61 which is positive but not significant. *(Severina E. Nelson, Illinois.)*

TODD, KATHLEEN M. The technique of child psychiatry. *J. ment. Sci.*, 1945, **91**, 206-212.

The technique of child treatment lies in a threefold study of: (1) the temperamental make-up and basic pattern of personality, (2) the psychoneurotic superstructure, the psychopathological personality, (3) the symptoms. Through play, talk and other forms of exploration of the child's conscious and unconscious mind, the psychiatrist attempts to determine the degree of control which the child is able to maintain with respect to his emotional problems, and which of the mechanisms, e.i., repression, regression, identification with parents, projection, etc., are indicated by the symptoms which he exhibits.

Child treatment is still in its infancy, and a technique has yet to be evolved. In future work what is needed is a deepening of the insight and the imaginative vision of the therapist and the enlargement of his knowledge through careful studies with individual children and follow-up records of these children after they have grown to adulthood. The author particularly stresses the training of the child psychiatrist in all the known methods of access to the child mind. Lastly she advocates a better liaison between the child guidance clinics and other branches of medicine, particularly pediatrics, mental deficiency, psycho-somatic medicine and, last but not least, adult psychiatry. The speech clinic might well have been included in this recommendation. *(Arthur Secord, Brooklyn College.)*

WOODWARD, F. R. Recovery from aphasia. *Bull. neurol. Soc. Los Angeles*, 1945, **10**, 73-75.

Two case reports are given with the autopsy of each. In the first case the autopsy revealed a lesion which was so located that the major side of the brain could not have recovered its function of language. The author states that the function was taken over by the minor side of the brain, for there was recovery from severe aphasia. In the second case the first attack with right hemiplegia was accompanied with aphasia; the patient's second attack seven years later was without aphasia. This was considered presumptive evidence that the minor side had taken over the function. *(Katherine Thorne, Minnesota.)*

ZARBAUGH, HARVEY. Hearing loss as an adjustive crisis for the personality. *Hearing News*, 1945, **3**, 5-10.

The author is convinced that there is no special psychology of the handicapped, that handicapped persons should be regarded as personalities facing a life crisis for the pre-existing personality. Psychological aid is needed for the successful management of the crisis. *(Rhoda Sutta, Halloran General Hospital.)*

JOURNAL OF SPEECH DISORDERS, 1945, **10**, 349-350

Book Reviews

Ernest H. Henrikson, Editor*

TRAVIS, LEE E. *Speech Pathology.* New York: Appleton-Century, 1931. Pp. 331.

ALTHOUGH this book is outstanding among speech pathology texts, it has not been evaluated in the *Journal,* a recognition which it most surely merits. Since the text is of such prominence, its contents probably are familiar to most persons who are working in speech correction, and there would be little merit in presenting a factual summary of it fourteen years after its publication. But there may be real merit in asking: What, in addition to factual content, does this book have to contribute today?

From the point of view of this reviewer, the important question is not whether the dominance theory as an explanation of the etiology of stuttering advocated by Travis is, or will be, accepted. No doubt other approaches, such as the psychological and semantic emphasis of Johnson, offer most significant additions to—possibly even substitutes for—the neurophysiological emphasis of Travis. Certainly research findings have not as yet written the last chapter on the causes of stuttering. Much remains to be explored. But even if the neurological theory of Travis should be completely discounted by later researches, the merit of his contribution still remains. In speech pathology, as in any other field of research, many 'wrong' theories must be explored and vigorously defended before the 'right' explanations emerge. The person who reads Travis merely to agree or to dispute will miss some of the most important phases of his contribution. Two of the most representative of these contributjons are:

(1) An emphasis on the whole rather than on the part in work in speech correction. This applies to the speech defective himself, who is to be considered first and foremost as a total person. It applies also to the process of speech production, which is to be envisaged as a unit involving the total mechanism even when individual sounds are being produced. Lest it be contended that this is fairly obvious now, the reader should re-examine recent books in the field to see to what extent an elementalistic approach still creeps in. This is especially evident in certain drills and exercises which, in spite of Weaver's warning of years ago against books 'replete with silly twaddle', beam their effort toward parts of the person, even toward special parts of the speech mechanism, with much too little attention to the total pattern in which that part is operating.

(2) A rigorous application of exacting experimentation to the exploration of hypotheses and theories. This experimentation incorporated the apparatus and techniques used in allied areas—psychology, physics and medicine, to mention only representative fields. The research should include as many facets of the person and his speech problem as possible. For example, with Travis, everything from the brain wave of the speech defective to the movement of his great toe was subject to scrutiny.

Perhaps one of the best evidences of Travis's contribution lies in the number of his students who are among those who are vigorously pushing ahead in research in speech pathology, even when the directions of investigation are different from and at times seemingly contradictory to Travis's point of view. *Speech Pathology* merits careful re-examination.

ERNEST H. HENRIKSON
University of Colorado

MAYFARTH, FRANCES (Editor). *Learning to Speak Effectively.* Washington, D. C.: Association for Childhood Education, 1943. Pp. 32.

AMONG problems facing the speech pathologist are those of working with specialists in other areas and of translating the materials of speech correction into a form and language serviceable to those specialists. This bulletin represents a contribution to the solution of these problems. For the speech pathologist, this pamphlet is significant mainly because it was sponsored by an allied organization. For the novice in speech correction, the materials of this bulletin will supply a general orientation. The materials will not add much to the store of information of the trained speech pathologist, but all who work in speech correction should examine the pamphlet carefully. They should see in it an example of an important avenue through which the 'gospel' can be disseminated. They should evaluate it critically, not as an example of the ultimate of what should be done, but on the basis of determining how what has been done may be extended and improved.

*Ernest H. Henrikson (Ph.D., Iowa, 1932) is Director of the Speech Clinic at the University of Colorado.

The Association for Childhood Education should be congratulated on the interest and spirit of cooperation which resulted in this bulletin.

ERNEST H. HENRIKSON
University of Colorado

RIDER, FREMONT. *The Scholar and the Future of the Research Library.* New York: Hadham Press, 1944. Pp. 236.

SPEECH pathologists should have a vital interest in the library, its functions and its problems. They are extremely dependent on it. Yet few of them probably have much insight into what happens behind the circulation desk and closed departmental doors. *The Scholar and the Future of the Research Library* will not give anyone a complete course in library science, nor does it pretend to present an exposition of all library problems. It does present a careful and stimulating discussion of one major problem—what is to be done about the ever growing mass of research material that is flowing into libraries?

The organization of this book is excellent. Six chapters are grouped under one heading: 'The Problem.' First comes a revealing chapter which, with the aid of figures and diagrams, points out how amazingly libraries have grown, why this has been so and why the growth is likely to continue. Following this is a definition of terms in a clearly presented chapter, 'What Do We Mean by "Research Library"?' and then a more exact breakdown of aspects of the problem under the heading 'The Four Main Factors of the Growth Problem.' The three chapters which complete Section 1 consider previous attempts to solve the problem: 'Weeding Out', 'Economies in Method', and 'Inter-Library Cooperation.' These chapters are ingeniously tied in with the earlier chapters on the problem of library growth. The problems and limitations of each of these solutions is developed in such a pattern that, when the solution which follows in Section 2 is presented, it stands as a solution not only for the major problem but also for problems relating to previous attempts at solution.

The second section, 'The Solution', consisting of eleven chapters, gives a detailed and well developed discussion of micro-cards. It includes everything from the text and format of micro-cards to when their publication should be initiated. These chapters present a clear exposition about micro-cards and how their use would solve the problems presented under Section 1. The author does not claim that no problems would remain. Rather, he contends that the major problems would be met and that detailed problems relating to the use of this new device could and would be solved as its use was developed.

Since I am not a librarian, I do not claim to evaluate this book against a background of training in library science. As a speech teacher, I found it an interesting and challenging discussion of a problem which is of major concern to teachers of speech. Other speech teachers should find it interesting and challenging too. The following statements, made by the librarians at California, Harvard and Mount Holyoke, indicate what some library experts think about the book, 'Your idea is the most constructive approach to the problem I have heard from any source.' 'It is intensely interesting and thought-provoking.' 'I am more and more sure that you have hit upon an idea which will have important and far-reaching results.'

ERNEST H. HENRIKSON
University of Colorado

PINTNER, RUDOLPH, EISENSON, JON, and STANTON, MILDRED. *The Psychology of the Physically Handicapped.* New York: Crofts, 1941. Pp. 391.

Those who are searching for a useful compendium of statistical knowledge of the physically handicapped will find this book a valuable reference. The authors have written it with a view to its use as a text book for courses in the psychology of the physically handicapped, but a wider use will probably be made by teachers of special education, social workers, nurses and physicians who must have access to these materials although they may bear only tangentially on their work.

The chapters on each class of defectives: 'The Blind', 'The Deaf', 'The Crippled', 'The Defective in Speech', etc., follow a uniform plan of presentation, viz., intelligence, educational achievement, personality, and special abilities. In the chapter summary, the essential differences in psychological profile between the handicapped and the normal child are stated succinctly.

The introductory chapters on personality development, mental hygiene and the nervous and endocrine systems are not comprehensive, but are intended as a review of basic principles of psychology. The discussion often seems too fragmentary to be of great value. The bibliography at the end of each chapter, although extensive, does not always include the most recent materials on the subject.

The speech clinician will be interested not only in the chapters on 'The Deaf' and 'The Defective in Speech' but also in the concluding chapter on speech involvements of the blind, the spastic, the choreatic, and others.

It is an attractive, readable and useful book.

MILDRED F. BERRY
Rockford College

JOURNAL OF SPEECH DISORDERS, 1945, **10**, 351-352

PROGRAM
Twenty-first Annual Conference
of the
American Speech Correction Association

THE AMERICAN Speech Correction Association will hold its 1945 convention December 27, 28 and 29 in conjunction with the National Association of Teachers of Speech at the Deshler-Wallick Hotel in Columbus, Ohio.

With travel restrictions removed and some of our members released from their war duties, there is every reason to anticipate a large attendance for this Reconversion Conference.

The program for the 1945 meeting is as follows:

Wednesday, December 26

1:30 p.m. Meeting of officers and councilors of the Association.
7:30 p.m. Meeting of officers and councilors of the Association.

Thursday, December 27

8:00 a.m. Registration.
9:00 a.m. Joint session with the National Association of Teachers of Speech.
10:30 a.m. Short Course: Problems and Methods in the Fitting of Hearing Aids. *Captain Raymond T. Carhart, Deshon General Hospital.*
12:00 m. Adjournment.

TECHNIQUES AND PROCEDURES FOR THE DEAF AND HARD OF HEARING
(Joint session with N. A. T. S.)
Chairman: Robert West, University of Wisconsin

2:00 p.m. Educational Values of the Visual-Hearing Method of Teaching a Visual Comprehension of Speech. *Marie K. Mason, Ohio State University.*
2:45 p.m. A Test for Determining Malingering and Psychological Deafness. *Lt. Leo Doerfler and Sgt. Kenneth Stewart, Deshon General Hospital.*
3:10 p.m. A Multiple-Choice Test of Hearing. *T. Earle Johnson, University of Alabama.*
3:40 p.m. A Standardized Test of Lip Reading Ability. *Jean Utley, Northwestern University.*
4:10 p.m. Adjournment.

4:15 p.m. Short Course: Theory and Application of the Moto-Kinaesthetic Method. *Edna Hill-Young, University of Denver.*
5:45 p.m. Adjournment.

8:00 p.m. Business Meeting.

Friday, December 28

9:00 a.m. Short Course: Speech Problems of Aphasic Cases. *Charles Strother, State University of Iowa.*
10:30 a.m. Adjournment.

TECHNICAL PAPERS
Chairman: Harry J. Heltman, Syracuse University

10:45 a.m. Control of Athetotic Tremors by Sound Stimuli. *Martin F. Palmer and Louis E. Zerbe, University of Wichita.*

11:15 a.m. Comments on Testing Aphasics in the Speech Clinic. *Clarence T. Simon, Northwestern University.*

11:35 a.m. An Analysis of Auditory Incomprehension in Aphasics: Suggestions for Retraining. *Mary Huber, University of Minnesota.*

12:00 m. Adjournment.

12:15 p.m. Joint Luncheon, ASCA, NATS, AETA, NUEA and Thespians.
Speaker (courtesy of Thespians): Jasper Deeter.

TECHNICAL PAPERS
Chairman: Hildred Gross, Detroit Public Schools.

2:15 p.m. Teaching Techniques and Materials Used in the Rehabilitation of Aphasics in an Army Hospital. *Vivian Mowat, Percy Jones Hospital Center.*

2:40 p.m. Linguistic Problems of Deafened Veterans Returning to the Universities. *Alice Mendenhall, University of Minnesota.*

3:00 p.m. Some Findings of Use of Prostigmine with Cerebral Palsied Children. *Berneice Rutherford, Dowling School, Minneapolis.*

3:20 p.m. Differential Diagnosis of Aphasia. *Lorna Stobbart Nance, University of Iowa.*

3:40 p.m. Adjournment.

SPEECH REHABILITATION
Chairman: Harold Westlake, Northwestern University.

4:00 p.m. Perspective from the Rehabilitation Committee of the ASCA. *Harold Westlake, Northwestern University.*

4:20 p.m. The Navy Rehabilitation Program. *Lt. Comm. Herbert Koepp-Baker, Naval Hospital, Philadelphia.*

4:40 p.m. The Program of the Veterans' Administration. *C. E. Hostetler, Chief of Vocational Rehabilitation and Educational Division, Veterans' Administration, Hines, Illinois.*

5:20 p.m. Discussion.

5:45 p.m. Adjournment.

Saturday, December 29

SYMPOSIUM ON TEACHER TRAINING AND CERTIFICATION
Chairman: Delyte Morris, Indiana State Teachers College.

9:00 a.m. Present Requirements in State Legislation. *James A. Carrell, University of Washington.*

9:20 a.m. Teacher Training Programs in Colleges and Universities. *Severina Nelson, University of Illinois.*

9:40 a.m. Discussion of Training Standards and Certification Needs and Requirements. Panel: Ollie Backus, University of Michigan.; Magdalene Kramer, Columbia University; Martin Palmer, University of Wichita; Lavilla Ward, State Department of Public Instruction, Madison, Wisconsin.

10:40 a.m. Adjournment.

11:00 a.m. Business meeting.

PROGRAM COMMITTEE: Bryng Bryngelson, Eugene McDonald, Elizabeth M. Nemoy, S. Richard Silverman, Harold Westlake, and Clarence T. Simon, Chairman.

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